JANUARY 16, 1937

ELECTRICAL WORLD

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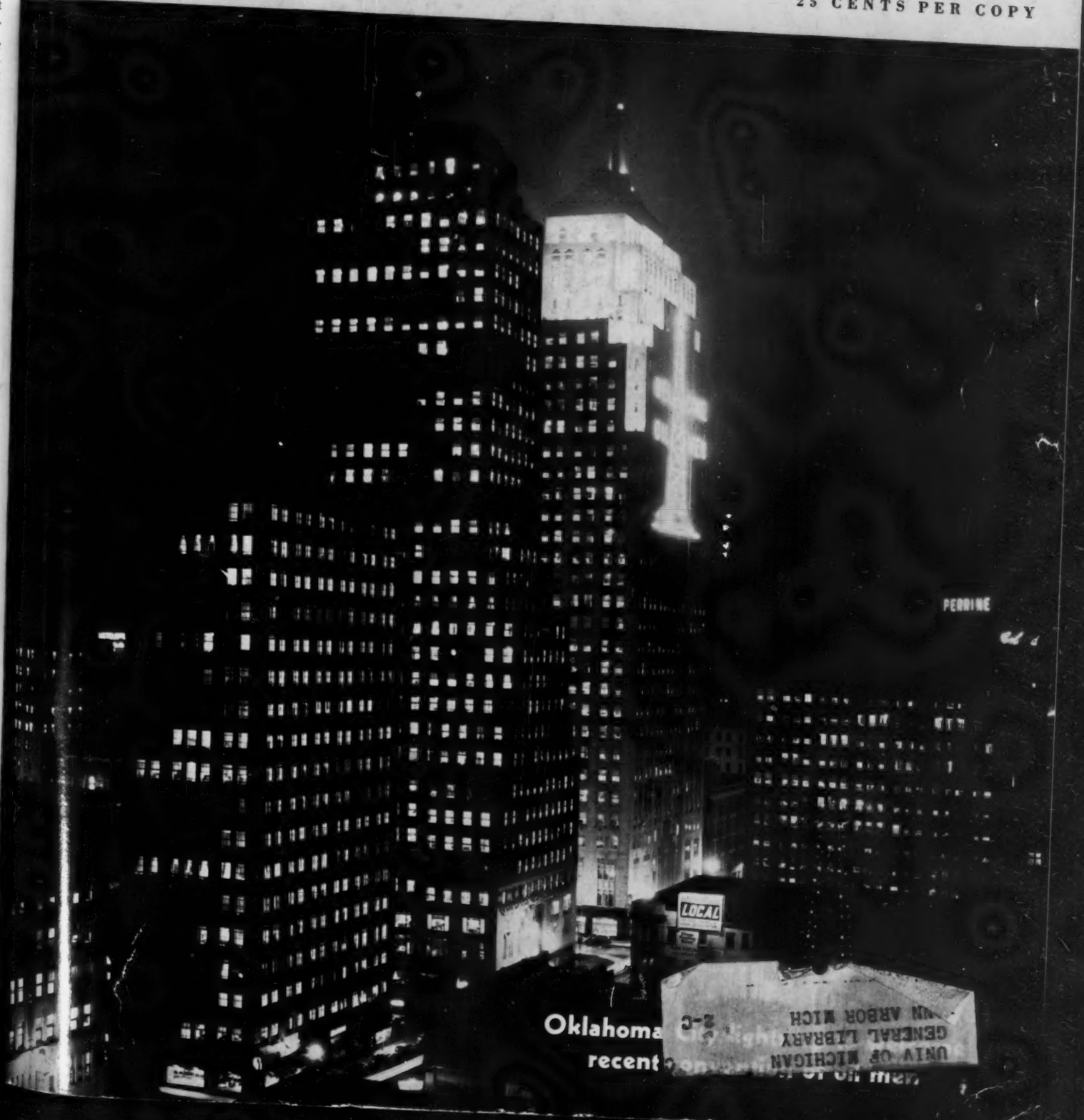

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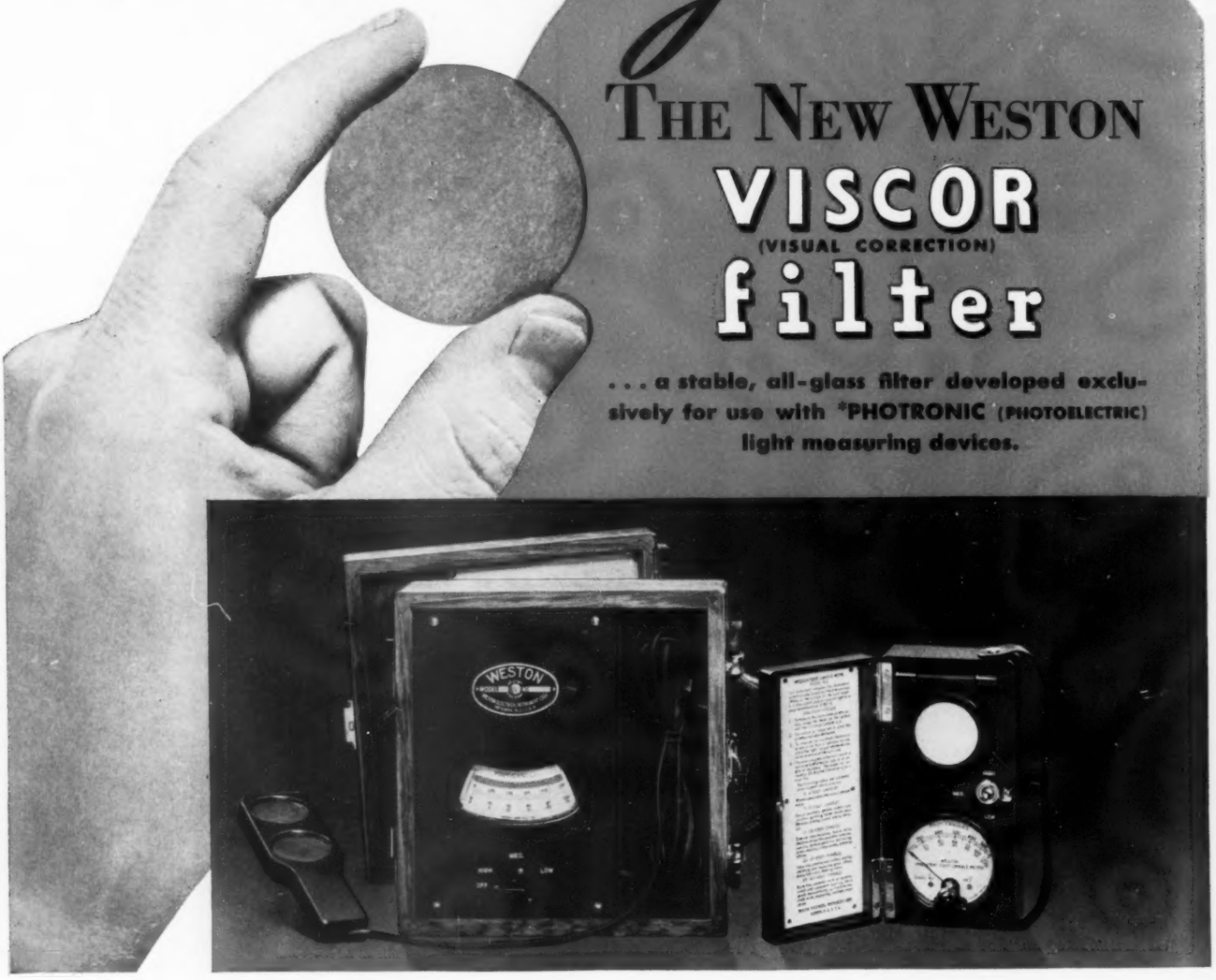

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ELECTRICAL WORLD

JANUARY 16, 1937

Engineering Approach to Understanding

When electric utilities were bearing the major brunt of governmental competition and repression they warned business in general that all might ultimately face a similar situation. That time has arrived. An epidemic of sit-down strikes has culminated in a major effort against the automotive industry. Social security has just started adding to the tax on industry. Many other laws and restraints are promised, including a revival of an NRA or its equivalent. Industry as a whole is at last awakening to the surmise that neither its employees nor its patrons have an adequate understanding of the functions, responsibilities and limitations of American business as the mechanism whereby we survive and thrive.

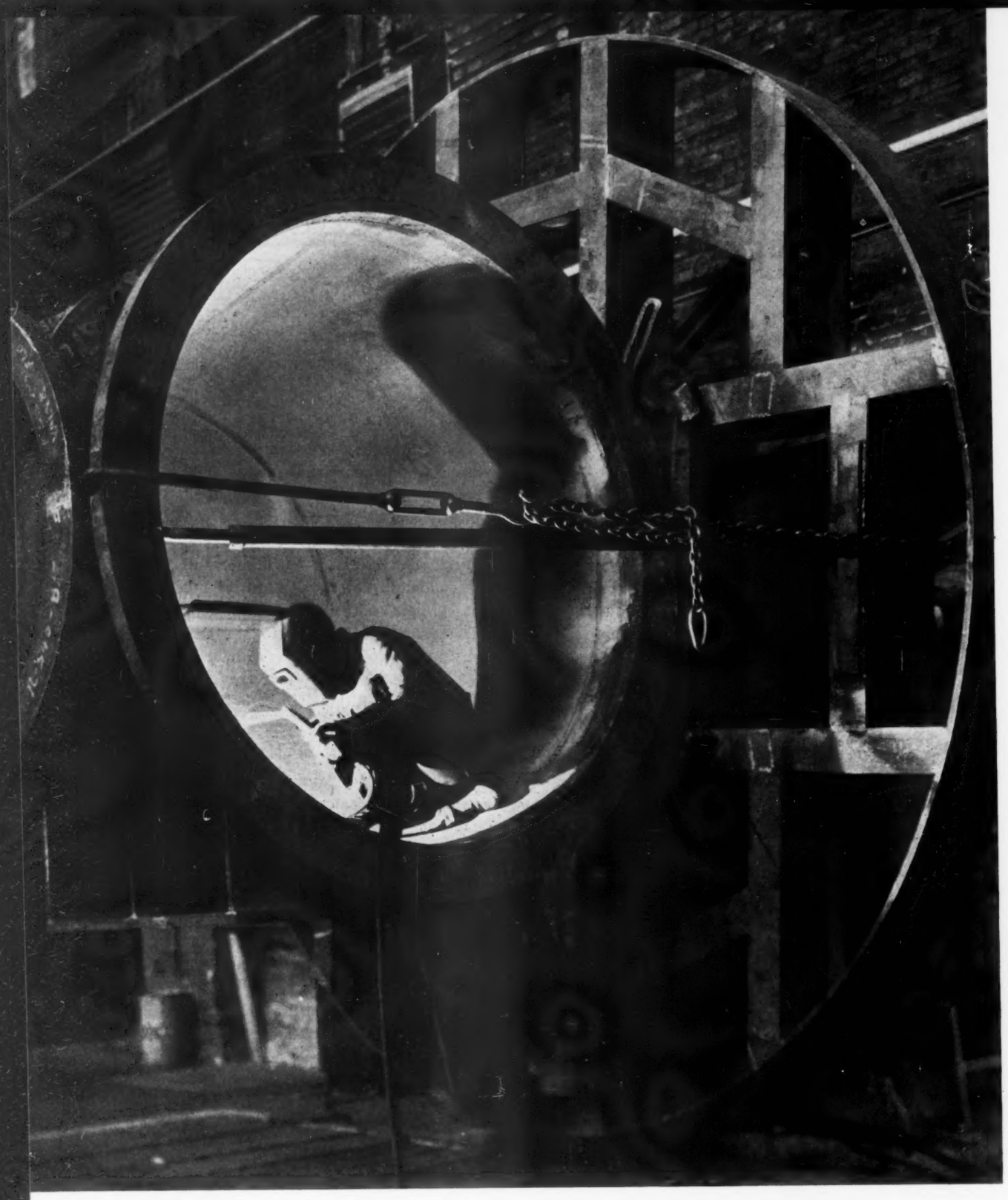
But little is being done. Inertia is primarily to blame, but such inertia is merely the absence of a force applied to a mass. Those three are engineering terms applied to a psychological system presenting a mass mind needing to be moved in a wholesome direction by a constructive force. It is a job of human engineering. It is immaterial whether non-engineering public leaders apply engineering methods to human inertia or, conversely, whether engineering minds become human enough in their outlook to adapt their so-called non-human technique to the tasks of mass and group psychology.

The first group revels in the intangible and in unsystematic procedure. The other worships the tangible and loves systematic procedure. Can this gap be bridged so that employees and the public will become more aware of the virtues of the American economic system? We believe that the engineering method of analysis would disclose the flaws and point the way to orderly procedure.

Engineers who can perfect combinations of complementary mercury and tungsten lights so draftsmen in a shipyard design room will suffer less eyestrain might conceivably have other ideas to advance in connection with the stabilizing of industry and employment. Those who devise new alloys to push electric furnace economy into still higher levels of temperature are laying the foundation for new industries and employment. Might not the same approach contribute something constructive to a system under which farmers could produce with profit goods that could be consumed by industry on an industrial price scale and thus dodge the perils of current agriculture?

Nor is it too much to claim that the same engineering thinking that extends the uses of an intricate laboratory replica of a far-flung transmission system could, if given free support, better ferret out the inadequacy and inequity of the prevailing social security legislation than the present method of political expediency. Likewise, the fitting of transformers to their consumer loads and of condensers to the economic improvement of industrial power factor involve tools of methodical analysis that are not so remote from those that could lay the foundation for a happier economic balance between the workers and those who employ them in industry.

We have chosen technical topics treated in this issue to illustrate that engineering talent of a practical sort justifies its accomplishments in terms of social and economic needs—the same needs as those confounding the political world of the day. Not only can the engineering approach adapt these principles to the solution of current problems, but it can also devise the simple technique of explaining the resulting program of industry to the public, restless because of an inadequate understanding. The utility industry, founded as it is on engineering, can well strive toward such a simple exposition of its objectives, motives and practices along with the other important industries.



CASTING YIELDS TO ROLL AND WELD

Operator at S. Morgan Smith plant welds stainless steel seat to body of 48-in. cone type valve for Milwaukee filtration system. Body is rolled plate. Flanges are steel castings.

Relays Tested on Artificial Line Board

Three-Phase Artificial Transmission Line Affords Multifarious Tests of Distance and Other Relays and Promoting Development of New Types

Relay technology is naturally a mystery to all but a few specialists. But most others can readily grasp what particular relays are expected to do if the miles of ramified circuit and the scattered faults are condensed into arm's length dimensions. This is one side-function of a board which G.E. uses to test relay assemblies and to conduct studies now that will make next year's relays available when the art demands them.

By C. D. HAYWARD

Switchgear Relay Engineering Department, General Electric Company

MODERN transmission line protective relays like, for example, the carrier pilot relay recently built for the Boulder Dam lines of the Bureau of Water and Power, city of Los Angeles, and the T.V.A. transmission lines, are required to operate with a combination of high speed, accuracy and infallibility only dreamed of a few years ago.

The development of these relays has required the solution of many problems in electrical and mechanical transients, never encountered in their slower speed predecessors. These problems are often very difficult and tedious to solve accurately with mathematics alone, but yield readily enough when attacked by the experimental method, making a series of tests guided and interpreted by mathematics. Again, the modern relay is an assemblage of relay units depending for the proper working of the whole on the harmonious interworking of the parts. Hence it is extremely important to study, test and adjust these relays and their parts while operating them at the factory under conditions duplicating as nearly as possible those which occur in actual installations.

On a real transmission line the elements of conductor reactance, conductor resistance and capacitance between conductors are uniformly distributed along the line. In building an artificial line, however, particularly one in which these elements may be varied independently to match the characteristics of lines having various conductor sizes and spacings, it is far simpler to lump the reactance, resistance and capacitance in undistributed units, connecting these units in an equivalent circuit, the over-all impedance characteristic of which matches that of the real line.

The electrical characteristics of either of the circuits of Fig. 1 approach those of a real line with an accuracy close enough for all practical purposes if the length of the transmission line section represented does not exceed 200 miles. When desired, the impedance characteristic may be made to match exactly by slightly modifying the values of the reactance, resistance and capacitance elements used in accordance with factors obtained by comparing the impedance equations of the π or T circuit with the hyperbolic equations of a real line.

For most relay tests, however, such circuit refinements are not considered necessary. As a matter of fact, for many tests, particularly on short lines under fault conditions, the capacitors may be omitted altogether, using the resistance and reactance elements only with satisfactory results. The capacitors may also be omitted on long line tests if suitable correction factors are applied to the values of reactance and resistance used. Proofs of the above and further discussion may be found in any standard transmission line reference book.

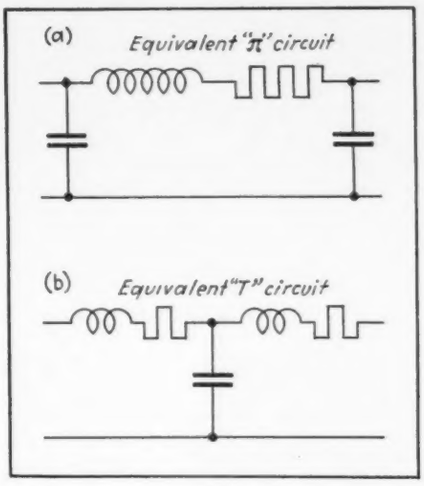


Fig. 1—Two equivalent circuits are suitable

For simplicity, the circuit for only one conductor to neutral is shown in each case. In the equivalent "π" circuit, so called because of the resemblance of the circuit diagram to the Greek letter π, the lumped capacitance is connected between line and neutral, half at one end of the line and half at the other, with the lumped reactance and resistance between. In the equivalent "T" circuit, so called because of the resemblance of the circuit diagram to the letter T, the lumped capacitance is all connected between line and neutral at the center of the line, half the reactance and half the resistance being connected either side. The "neutral" line referred to here should not be confused with "ground." The neutral shown in these diagrams is a purely fictitious line, having no reactance or resistance, and is introduced solely to simplify discussion. The ground, on the other hand, as in a line-to-ground fault, has very real values of reactance and resistance which must be taken into account as though it were a fourth line.

Many people, when being shown the test table, have asked the question: "How many miles of actual transmission line does this artificial line represent?" A direct answer to this question in terms of miles cannot be given, for a set-up on the table which might represent a certain number of miles of line of a given conductor size and spacing and operating at a given voltage and current might equally well represent a line several times as long having a different conductor size and spacing and operating at a different voltage and current. A more satisfactory answer can be given in terms of "secondary ohms," as measured on the secondary side of the station current and potential transformers where the relays are connected. The secondary reactance ohms for a given line are equal to the actual line-to-neutral reactance ohms, which for lines of a given conductor size and spacing is proportional to the length of the line, multiplied by the current transformer ratio and divided by the potential transformer ratio.

For example, assume that a 110-kv. transmission line equipped with 300-amp. current transformers has 0.8 ohm reactance per mile (a good average figure). The 0.8 ohm multiplied by 300/5 (the current transformer ratio) and divided by 110,000/110 (the potential transformer ratio) gives 0.048 secondary reactance ohm per mile. The 26 ohms per line of the test table multiplied by 5/5 (the current transformer ratio) and divided by 220/110 (the potential transformer ratio) gives 13 secondary reactance ohms. This value, divided by the 0.048 secondary reactance ohm per mile found above, gives 271 miles of line which may be represented by the table. Similarly it may be shown that about 354 miles of 287-kv. line equipped with 600-amp. current transformers or about 244 miles of 66-kv. line equipped with 200-amp. current transformers may be represented.

The artificial transmission line reactance ohms are variable in one-ohm steps, which means that the secondary ohms are variable in half-ohm steps.

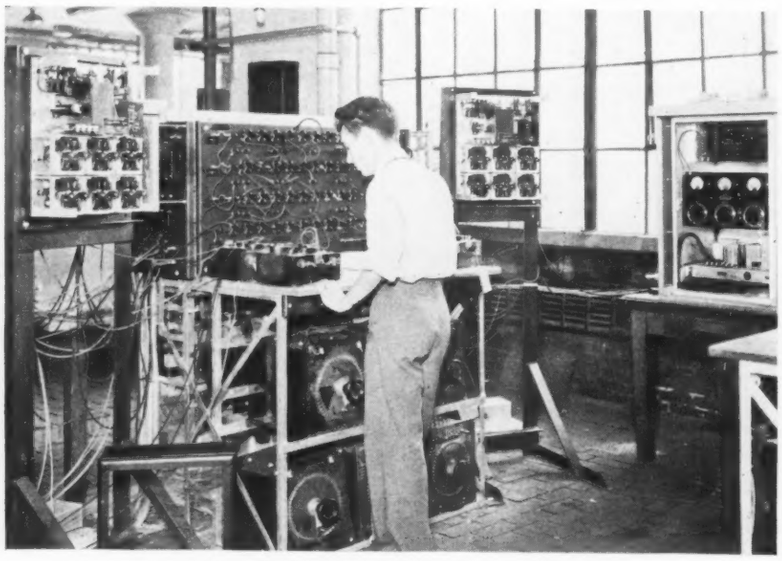


Fig. 2—Table set-up for line and terminals

Functions of generation, loading, switching, metering and relaying can be imitated and studied. The large front panel is the "transmission line panel." On it are mounted a number of terminals arranged in four horizontal rows; the three upper representing the three conductors of a three-phase transmission line and the lower one, ground. The terminals of each of the three rows representing a line conductor connect to thirteen reactor units, each of which has a 60-cycle reactance of two ohms with a one-ohm tap. The row representing ground connects to fifteen such units. The reactors are all mounted compactly within the table framework. Leads from both ends and the tap of each reactor coil are brought out to separate terminals, so that each reactor, being both electrically and magnetically separate from the others, may be connected into the circuit in any way desired.

The reactors are constructed with long air gaps in their magnetic circuits to insure constancy of reactance over a wide range of current values. They have a natural power factor angle of 80 deg. on 60-cycle current. This is a little more lagging than the average transmission line, but for many tests it is sufficiently close so that the reactors may be used alone. For other tests, where it is important to match the line power factor more closely, appropriate values of resistance may be connected in by means of the terminals on the front transmission panel. For still other tests, where the duplication of line capacitance is required, these terminals may also be used to connect suitable capacitors between the lines arranged in π or T sections as previously explained.

Co-ordinating with the front "transmission line" panel, two smaller panels, mounted on the two sides of the table framework, may be called "station" panels. Through them alternators, relays, circuit breakers and other equipment, representing generating, relaying and switching functions, are connected into the artificial transmission line. Near the top of each of these panels is mounted a three-pole magnetic contactor representing the station circuit breaker. This contactor connects lines leading from the main test switchboard (not part of this equipment) to terminals on the "transmission line" panel. By this means it is possible to connect into the line any of a large number of test alternators and motors, having different characteristics. Eight 5/5-amp. current transformers (four to each station) and six 220/110-volt potential transformers (three to each station) are also mounted in the table. The primaries of these transformers are connected to terminals mounted on the front panel between the rows of terminals representing the lines, where they may be readily connected into the artificial transmission line network at points where it is desired to "locate" stations. Their secondaries are connected to terminals on the station panels, where they may be connected to the relays associated with the stations. On each station panel there is also a terminal, which, when connected in the trip circuit of the test relays, makes the station contactor trip when the relays operate. Other equipment mounted on each station panel includes terminals for 110-volt a.c. and 125-volt d.c. supply and a single-pole knife switch which serves as the station alternator field switch.

On the back panel a third magnetic contactor, known as the "fault contactor," is mounted. This contactor has four main poles which connect four terminals arranged in a vertical row in the center of the front transmission line panel, with four others mounted directly under the contactor on the back panel. The terminals on the front panel may be connected into the transmission line in various ways to simulate various kinds of faults. The terminals on the back panel may be directly connected together to simulate a solid fault or through suitable resistors to simulate arc resistance.

Directly above the fault contactor (back of panel) is mounted a time-delay relay which acts to trip automatically the fault contactor a definite interval of time after it is closed to give back-up protection against burnout of the test table wiring, in case the station relays fail to operate if the fault is held on too long for any other reason. Other apparatus on the rear panel includes fused line switches for the 110-volt a.c. and the 125-volt d.c. control sources, as well as resistors and auxiliary relays required for operation of the contactors.

In the front section of the test table framework, under the table top, are mounted six rheostats used for controlling the field currents of the station alternators and their driving motors, thus providing voltage and frequency control. Mounted on a narrow apron panel, directly under the front edge of the table top, are three push-button stations for controlling the three contactors and eight terminals for the field rheostat connections.

Smaller steps are often necessary, particularly when representing short lines. These may be obtained by paralleling two or more reactors or by using a variable reactor in conjunction with the fixed ones.

The amount of resistance and capacitance to use on the test table set-up may be found from the actual line values and the current and potential transformer ratios in the same way as the reactance.

Two tables in regular use

Two test tables as described have been built and are in use in the General Electric switchgear relay department. One was set up to test the carrier pilot equipment built for use on the Boulder Dam and T.V.A. transmission lines. Two carrier pilot relay units, one for each end of the line, are shown (Fig. 2) mounted on stands placed on either side of the test table. One of the two carrier current transmitting and receiving units is shown on the table near the window; the other, scarcely visible in the photograph, is set up at the rear of the test table.

An oscillograph used in recording the tests is also set up back of the test table and not visible in the photograph. The high-frequency carrier current was not sent through the test table, since the reactors, designed for power line frequencies, would not have the proper characteristics at carrier frequency. A separate artificial line having the proper characteristics was used. It may be seen in the illustration, together with the line coupling capacitors, on top of the box which houses the carrier current transmitter and receiver, near the window. The line coupling capacitors are small, low-voltage ones to be used for coupling to the rear line.

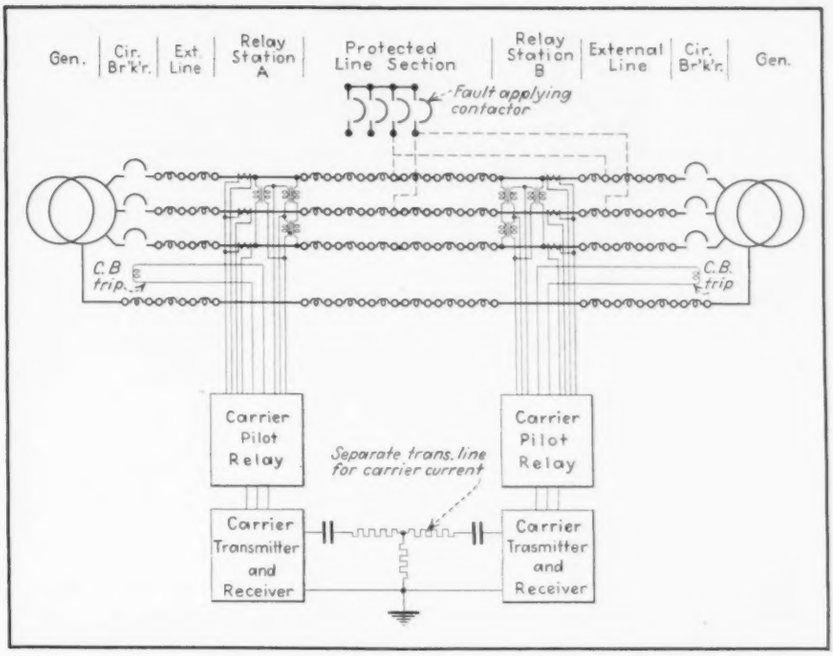


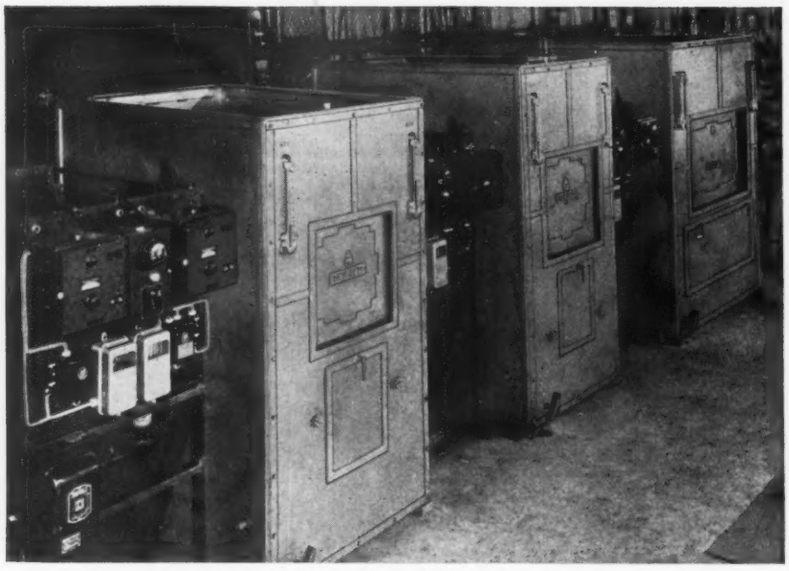
Fig. 3—Carrier pilot relays tested in typical set-up

Each pair of carrier pilot relays, with associated carrier current transmitters and receivers, was given a total of 135 different tests on the artificial transmission line test table before leaving the factory. Operation was checked for every kind of fault, inside and outside the protected line section, on single and on parallel lines, with and without load, with various generating conditions, with various combinations of simultaneous faults, with generators at the two ends of the line out of step, etc. Such an exhaustive series of tests would not have been possible within a reasonable length of time without the use of the artificial transmission line test table.

The test tables have also found extensive use in testing distance relays supplied to the Electricity Supply Commission in South Africa, to the Buffalo, Niagara & Eastern Power Company, to the Tennessee Electric Power Company, to the Pennsylvania Railroad Company, and others. Distance relays are so called because they determine whether or not the fault is within the protected line section by measuring the direction and distance to the fault. The distance is determined by measuring the amount of transmission line reactance (which is directly proportional to distance) between the relay station and the fault. The artificial transmission line tables are excellently suited to testing this type of relay.

ENGINEERS — THE ARISTOCRATS OF OUR TIME

Just why a whole region should have been paralyzed the experts have still to determine. Yet at this early date it seems clear that the widely followed practice of pouring all the energy from several stations into a single distribution network should be reappraised. Possibly a system composed of smaller distribution units, each of which can be isolated and repaired without disturbing the rest, would be more suitable for a densely populated area. Assuredly a minor accident in a substation should not be permitted to throw a whole region into confusion. It speaks well for the central station companies that we hear so rarely of these disruptions in service—so well designed are plants and distribution systems, so admirably organized are the technical crews that maintain equipment in perfect condition. If Newark's misfortune indicates the necessity of re-examining engineering practice in the light of electrical needs, it also emphasizes the indispensability of energy in modern life. What many of us still regard as push-button conveniences, mere adornments of life, prove to be essential in a mechanized society. A flash in the oil of a switch is enough to throw us back a century, enough to make us realize how much we owe to science and technology. Statesmen, legislators we need to govern us, but the real rulers of society, the men who keep the wheels spinning, are the engineers—the aristocrats of our time.—*From New York Times editorial "Newark Teaches a Lesson."*



Heat-treating high-speed steel

Temperatures up to 2,300 deg. F. are regularly employed in these "Alloy 10" furnaces for production of high-speed steel parts in the heat treating department of a large heavy machinery manufacturer

New Alloy Extends Range of Electric Heat Application

By H. E. KOCH

Vice-President Hevi Duty Electric Company, Milwaukee, Wis.

Upper limit of resistance heating raised to the order of 2,400 deg. F. by "Alloy 10" of iron, chromium and aluminum. Ceramic firing and high temperature heat treating, fields hitherto untouched, now open to electric furnaces

•

FOR a long time there has been a continuous search on the part of electric furnace builders for a heating element which could be run at temperatures higher than those possible with nickel chrome materials. Some twenty years ago A. L. Marsh, who is known as the originator of "Chromel" nickel chrome alloy, did some work on certain alloys of iron, chromium and aluminum and showed at the time that this type of alloy was highly resistant to oxidation at elevated temperature. Since that time the iron chrome aluminum alloys have had only intermittent attention, due to the difficulties encountered in melting and fabrication.

About five years ago the A. O. Smith Corporation began to investigate this problem. With an eminent staff of scientists and metallurgists at their disposal, together with research facilities among the finest in the country, S. L. Hoyt and Robert Archer investigated a whole series of possible alloys which might be useful for this work, and after months of diligent effort discovered an alloy of iron, chromium and aluminum which was a somewhat radical departure from what had been produced before. This new alloy very quickly proved to have outstanding characteristics when used at elevated temperatures, and Dr. Hoyt and Mr. Archer were granted U. S. and foreign patents on the new material.

As soon as reasonable quantities of wire were available test furnaces were built on a semi-commercial scale to try out the element in manufacturing plants in the Milwaukee area. It is of interest to note that two of the original test furnaces are still in operation, having had no attention or maintenance whatever. A Telechron hour counter installed to show the hours one of the furnaces actually had been used indicated 18,700 hours at a recent reading, all at temperatures ranging from 2,000 to 2,300 deg. and including several overheating cycles where the temperature was as high as 2,500 deg. F.

The new alloy is known as "Alloy 10" and has been used quite extensively in high-temperature furnaces manufactured by Hevi Duty Electric Company, which has acquired patents covering the alloy and the method of making it from the A. O. Smith Corporation. Hoskins Manufacturing Company and Driver-Harris Company have been licensed to make and sell the material in wire and rod form to the trade generally.

The general characteristics of "Alloy 10" are:

Composition: 37.5 per cent chromium, 7.5 per cent aluminum, 55.0 per cent iron.

Forging temperature: 2,350-2,450 deg. F. finish forging at 2,100 deg. F.

Rolling temperature: 2,350-2,400 deg. F. finish rolling at 1,700 deg. F.

Swaging temperature: 2,100-1,700 deg. F.

Specific resistance at 80 deg. F.: 1,000 ohms per circ.mil ft.

Temperature coefficient of resistance (after aging): 5% (1,400-2,600 deg. F.).

Density: 6.9 grams per cubic centimeter.

Pounds per cubic inch: 0.25.

Machining: Best results with high-speed steel at slow feeds and speeds.

Welding: Oxyacetylene torch or carbon arc welder.

Expansion coefficient: 10×10^{-6} in. per in. per deg. F. (80-2,400 deg. F.).

Growth or permanent elongation: ¼ in. per ft. at 2,400 deg. F.

Of the properties shown the specific resistance of 1,000 ohms per circ. mil ft. is of special interest. This is approximately 50 per cent greater than nickel chromium grades and permits with equal ampere ratings an increase of 50 per cent in the power liberated by the element.

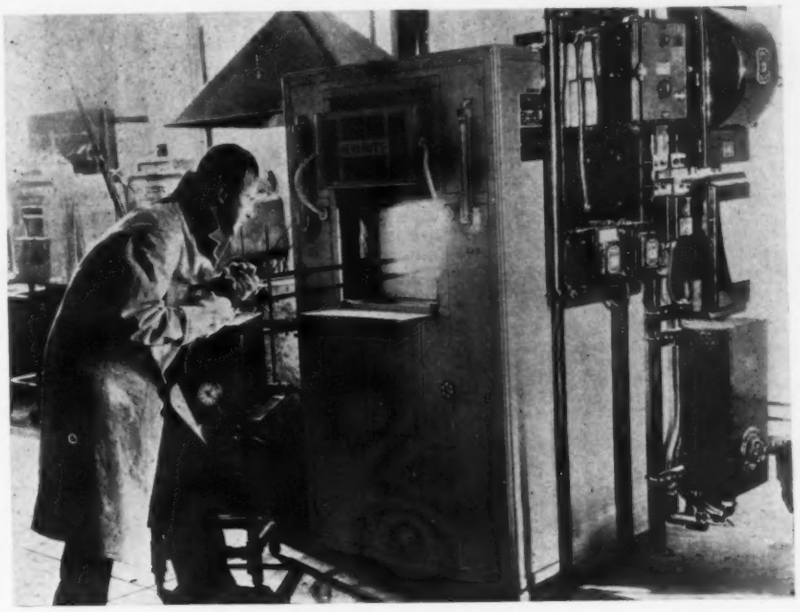
An important characteristic which gives "Alloy 10" high resistance to destructive oxidation is an aluminum oxide which forms initially on the surface of the wire when heated to operating temperature. This oxide is practically impervious to further attack, either by oxidizing or reducing gases, and makes it possible to use the alloy under varying conditions of furnace chamber atmospheres.

Having in mind the fact that "Alloy 10" can and is used successfully for furnace operating temperatures to 2,400 deg. F., the question then arises as to what this means in a practical way to an electric load-building program.

Applications for "Alloy 10"

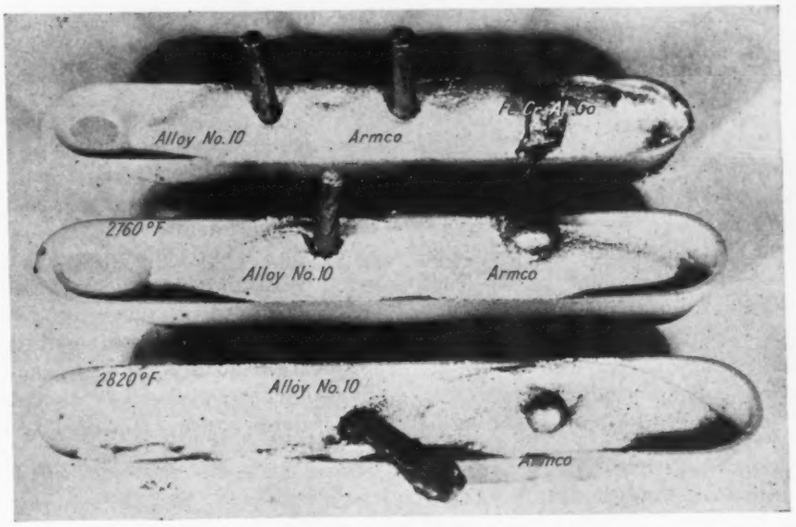
First of all, we must keep before us the range of temperatures in which we are working. There exists in the range between 2,000 and 2,400 deg. F. a great need for accurate and uniform heat treating of metal products and ceramic ware which has been practically untouched with electric furnaces, simply because suitable equipment was not available. The past year has shown very conclusively the marked improvement of product which can be expected from a uniformly heated electric furnace. This is particularly true of the treatment of high-speed steels. There is also a wide interest on the part of ceramic manufacturing plants in the use of electrically heated kilns for firing pottery and china ware, a field which should develop rapidly because of the large savings in firing time which can be made with the electric equipment.

From a standpoint of cost of operation it must be remembered also that, as temperatures rise, fuel efficiencies drop very rapidly, while high efficiencies can be well maintained with properly designed electric equipment. On a B.t.u. basis costs show a very favorable comparison for the electric installation where power sells for 1 to 1½ cents per kilowatt-hour, as compared to 40 cents per thousand for 1,000 B.t.u. gas. When over-all costs and quality of product are considered the results are very definitely in favor of the electric equipment.



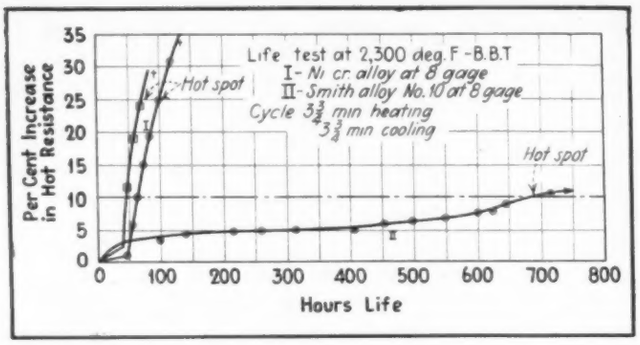
For research work

A high-temperature—2,350 deg. F.—atmosphere control furnace in a steel research laboratory.



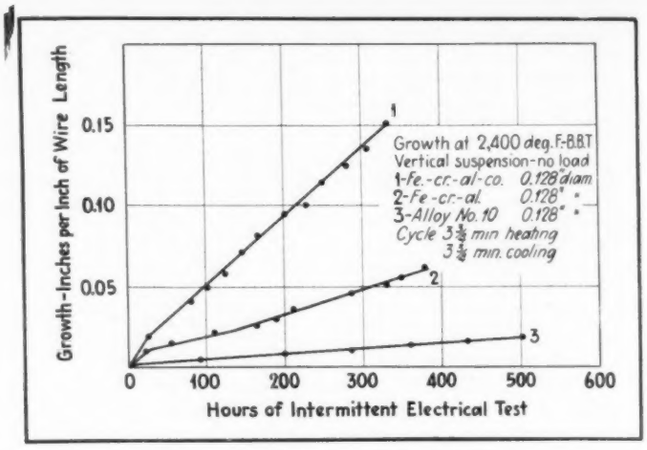
Melting tests on "Alloy 10"

A piece of pure iron wire and a piece of "Alloy 10" wire, both ⅛ in. in diameter, were placed in an "Alundum" boat. The boat in turn was placed at the center of a molybdenum-wound hydrogen furnace and the temperature raised until the iron melted down. At the same time pyrometer measurements were made on the wires themselves. The center boat shows what happened. On the right it may be seen that the iron wire has fused completely, while the temperature recorded by the pyrometer was 2,760 deg. F. The true melting point of iron is 2,785 F. when corrected for black body conditions. It will be noted that "Alloy 10," which is at the left, shows no sign of melting at this temperature. In a second test the same procedure was repeated, except that this time the temperature was raised above that of the melting point of iron until the "Alloy 10" specimen went over. The temperature at which this occurred was 2,820 F. as measured by the pyrometer. These results are shown in the bottom boat. To carry these studies further another test shown in the top boat was run, using a lower iron chrome aluminum cobalt alloy, an iron wire, and a wire made of "Alloy 10."


Life test at 2,300 deg. F - B.B.T
I - Ni cr. alloy at 8 gage
II - Smith alloy No. 10 at 8 gage
Cycle 3¾ min. heating
3¾ min. cooling
Hot spot
Hot spot
Per Cent Increase in Hot Resistance
Hours Life

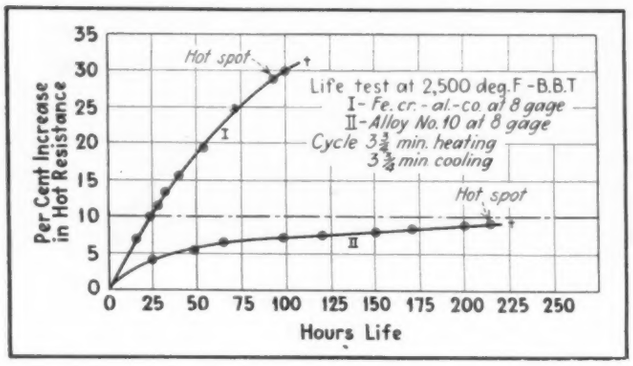
More than 700 hours at 2,300 deg. F.

Here is shown a destructive life test at 2,300 deg. F. of "Alloy 10" compared with 80 per cent nickel, 20 per cent chromium alloys. To make a comparative test of this kind it was necessary to drop the test temperature considerably to get into the nickel chrome range. The results show very conclusively the superiority of "Alloy 10" over the nickel chrome alloys for elevated temperature use. The "Alloy 10" life is practically seven times that of the best nickel chrome alloy at the test temperature.


Growth at 2,400 deg. F-B.B.T
Vertical suspension-no load
1-Fe.-cr.-al-co. 0.128" diam
2-Fe.-cr.-al. 0.128" "
3-Alloy No. 10 0.128" "
Cycle 3¾ min. heating
3¾ min. cooling
Growth-Inches per Inch of Wire Length
Hours of Intermittent Electrical Test

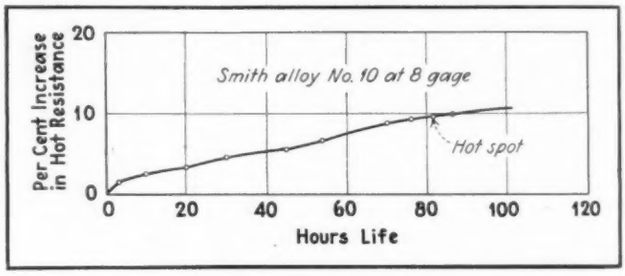
Extremely low growth factor

One of the important characteristics of any heating element is what is known as growth. In a heating element in wire form this shows up principally as a permanent increase in length. Elements made of alloys having large growth are difficult to keep in place in the furnace and cause troubles with the electrical refractories holding them in place. The low growth characteristics of "Alloy 10" compared to other iron chrome aluminum alloys at a test temperature of 2,400 deg. F. are shown here.


Life test at 2,500 deg. F - B.B.T
I - Fe. cr. - al. - co. at 8 gage
II - Alloy No. 10 at 8 gage
Cycle 3¾ min. heating
3¾ min. cooling
Hot spot
Hot spot
Per Cent Increase in Hot Resistance
Hours Life

Life at 2,500 deg. F.

This graph brings out a comparison of "Alloy 10" with what was considered the best other alloy of this general group; 2,600 deg. F. was too high a temperature for the chrome iron aluminum cobalt material and the test was run, therefore, at 2,500 deg. F.



Uniform resistance change

Typical accelerated life test of "Alloy 10" at a temperature of 2,600 deg. F. The resistance change which takes place while the test proceeds is quite uniform. The time for a 10 per cent change of resistance shown here is approximately 80 hours, at which time hot spots developed in the test specimen. A hundred-hour test to burnout with normal resistance changes as shown represents usually a good grade of material which in actual furnace operation would be good for several thousand hours.

Beyond a consideration of quality and cost of operation, one of the large deciding factors today as to whether a job should be electric or fuel fired is the plant layout itself. New plant programs are very definitely eliminating the old program of trucking tons of materials long distances to what was called a heat-treating department. The heat-treating machinery now is placed directly in the line of production right next to other machine tools. In this kind of set-up the electric equipment with quiet, clean and convenient operation has a decided advantage.

With "Alloy 10" these possibilities are enlarged materially. The amount of steel which needs to be heated to temperatures above 2,000 deg. F. for ingot soaking, rolling, reheating, forging and forming exceeds by many times the quantity that is eventually heat treated for proper physical characteristics. It is this market which "Alloy 10" makes available, and that is the reason we consider this new development in electric heating one of major importance to the electric utility industry.

TOWARD A BETTER HOME

I am extolling electricity as having been responsible for more comforts and conveniences to the home and its occupants than any single influence of which I am aware . . . Today the one definite trend in home buying is the demand for more and more electrical equipment . . . I am convinced that to be successful in building for homes electrical equipment must be installed to make it possible for the young housewife to keep her home comfortable and attractive with a minimum amount of labor and to enjoy the many outside interests which youth nowadays has . . . No modern kitchen is complete without an electric refrigerator or the new electric pig . . . The electric hot water heater completes the list of servants. The electric home is no longer a dream of tomorrow—it is a home of today.

—C. A. GLEASON, Boston realtor for 50 years, before the Metropolitan Electrical League.

Human Engineering—Salvation of Industry

Industry Needs to Understand the Mass Public Before There Can Be Public Understanding of Industry

By LAURIN E. HINMAN

Executive Assistant Portland (Ore.) General Electric Company

SURELY no thinking person in the business world needs proof of the fact that business is today at the crossroads. Whether industry as we have known it shall continue to endure or whether the entire industrial life of this nation shall undergo a material change with an uncertain future both for capital and labor depends almost entirely upon industry's own actions within the next few years.

This is not the statement of an alarmist—it is a statement of fact and it has found, of late, constant repetition by the world's leading analysts. Dr. Adam S. Bennion, one of our leading industrial psychologists, said: "An intelligent mass opinion is the hope of democracy—it is industry's only salvation."

Industry is the daily target of political demagogues who have a very good chance to succeed in the destruction of industry as we know it unless industry, itself, awakens and puts its house in order. We have witnessed an incident where less than 1 per cent of the total population of a great nation, Russia, completely overthrew the existing régime. We have seen one man completely change and control the thinking and mass reaction of the Italian people.

At this point some one says, "But it can't happen here." Well, it is happening here. The past few years have seen the people of America yield to virtual dictatorship.

The leaders in these various movements have accomplished the results they sought because they understood a simple law governing the actions of human beings. That law is "human beings, as a general rule, do not react according to logic and reason, but

according to emotions." This law is as inflexible as is that old physical law known as the law of action and reaction.

The greatest need of industry today is to be understood by the masses. Much misunderstanding exists in the mass mind regarding large industries, corporations and so-called big business. Their very size induces fear in the public mind. Fear is a lack of understanding.

When utilities were bearing the major brunt of governmental competition and "anti"-subsidies they warned general business that all might ultimately face the same problem. Political trends now indicate that the burden of defense and education is shifting to all industry. The public misinterprets the motives and functions of business. This article is a timely index of the concern of the electrical industry in this international problem.

This takes us to a consideration of "human engineering." Human engineering may be defined as a knowledge of the forces which control, direct or influence human action and reaction. Human engineering is *not* something new, born in the mental laboratories of the psychologists. It is as old as the human race itself.

We in the utility business have given infinite care to the selection, the construction, the operation of the mechanical and material devices which we employ to render public service. But what do we do with the human elements both inside and out of our organizations? Practically nothing. An industrial executive not long ago made this statement to the members of his company:

"There are mornings when you dislike to get up and come to the office or shop; there are times when you hate to hear the office telephone ring; there are times when your customers irritate you, but I say to you in all sincerity, do not let your displeasure become known to others; do not take it out on your customers. Before you do that take a stick of dynamite and blow up one of our plants. We have financial reserves out of which we can replace a plant, but it is most difficult and sometimes impossible to restore the confidence of a customer which has been lost through our own carelessness, discourtesy or neglect, and we may never know what such loss may cost us."

We as industrial operators and managers are inclined to assume that

because we have given reasonable care to the selection and training of our employees everything is running smoothly. We are smug in the belief that all is well both within and without our organizations.

Industry's great need is to be understood by the masses, but industry's greater need is first to understand the masses and the individual making up that mass. The wild animal has a natural fear of man because it does not understand man. In order to win the confidence of an animal the trainer must first learn to understand that animal. Industry must first understand the masses before it can be understood by them.

Let me give you a concrete example: In the Pacific Northwest several years ago an attempt was made to combine two competing electric utilities in order to effect economies and reduce rates. The public overwhelmingly defeated such merger. The public denied this request because it was suspicious of the motives of the proponents. The utilities appealed to what they thought the public wanted —lower electric rates. And the public *wanted* lower electric rates, but there was something deeper wanted by the public but which the public had no way of collectively expressing—except at the polls, and then it was too late —and that was a mass understanding of the electric utility business. The cause of the merger defeat was expressed by one opponent when he crystallized the public fear just a few days before the election. He said: "Beware the Greeks when they come bearing gifts." Lack of confidence, misunderstanding of the *motives* of industry in that case did the trick.

In the case just mentioned and in all industry's problems at the hands of the public the great question is, "*What* does the public want, *how* does it want it, and *what* must we do to understand the public's wishes and to have them understand *our* problem in the fulfillment of those wishes?" The answer is, "Go to the public and learn."

Must first understand public

In my organization we now have had several years of applying and testing laws of human engineering. We decided that before the public could understand us we first must understand the public. So we went to them individually and collectively. We asked them to tell us truthfully what they thought of us and, more important, *why* they thought that way. We wanted criticism, and did we get it! From several thousand replies we discovered several things we had not known. We had thought that the public disliked us chiefly because of an experience with an Eastern holding company, and because we had passed

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"Human Engineering" suggests two things: First, a new branch of engineering applicable to business and social life; second, that industry is in a precarious position and in need of something to save it.

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dividend payments. We were surprised to learn that our stock and holding-company situation was not the preponderant cause of public disfavor. After classifying nine thousand replies we found that the complaint of high rates was No. 1 on the list.

Now here was a job for a specialist in human engineering. More than five thousand people out of nine thousand cited this one complaint of high rates. But the fact was that our rates were *not* high, but were among the lowest in the country. The electric service bill was the smallest single item in any family budget!

From these facts we knew that most of these people who complained about high rates were giving us a superficial reason or *belief*. These *beliefs* to which they ascribed their dislike were superimposed, as it were, upon a fundamental cause for dislike completely removed from the cause they stated. Their statements were nothing more than manifestations of two laws —the law of suggestion and the law of hidden complexes. There was some more fundamental reason for their dislike than the one they stated. Our job, then, is to find, without the customer realizing our quest, the real cause and apply such correctives as each specific case may dictate. To accomplish this, we must have a working knowledge of two other laws of human engineering, viz., the Law of Suggestion and the Law of Hidden Complexes.

It has been said that every institution is the lengthened shadow of one man. That is true. It follows that every department in an industrial organization is the lengthened shadow of the man who heads that department.

How often have you gone into an industrial establishment, to a large store, to a railway ticket office, and been received in a brusque and discourteous manner? You were made to feel that you were not entitled to much consideration and that you were sort of a necessary evil which was to be got rid of quickly. Now, what was the cause of such action toward you? Did that particular store clerk or that ticket agent or that industrial representative have a personal grudge against you? Oh, no. Either he had some personal worry or his superior had treated him brusquely, coldly, discourteously, and that chap was merely reacting as he had been acted upon. Human engineering, no less than mechanical, has its law of action and reaction.

I shall illustrate this law with two actual examples: The first one concerns the operation of a certain street railway division. The men operating the transportation units were capable, competent men. Suddenly an increasing number of complaints became apparent from that division. This was followed by an increasing number of accidents, some of them serious.

Summons to sanctum

The operators responsible for these complaints and accidents were repeatedly called on the carpet and properly criticised and disciplined, but little improvement was realized. Examination by an analyst, with an understanding of the laws of human engineering, revealed that the new superintendent in charge of those men was a crabbed, cold-blooded, hard-boiled individual. He never had a good word for his men, but always found plenty to criticise. The suggestions which his men tried to make at various times were not only ignored but his men were repeatedly told that they were not paid to do any thinking, that the superintendent would take care of that. Every institution is the lengthened shadow of one man and the operators on this division soon became the lengthened shadow of that superintendent. Was it any wonder that with a mind inflamed they became discourteous, could not keep their vehicles under proper control, and

[*Continued on page* 85]

Explosions by Gas From Cables Are Improbable

By WALTON P. LEWIS

Development Engineering Department, American Steel & Wire Company, Worcester, Mass.

CALCULATIONS based upon the explosive characteristics of the insulating compound used on one commercial network cable show that in order to evolve enough gas to cause an explosion in the average manhole it would be necessary to distill completely the insulation from about 150 ft. of a 500,000-circ.mil cable. These figures refer to a particular kind of rubber insulation and, obviously, would be entirely different for other rubber compounds and for varnished cambric or paper-insulated cables. However, it is quite apparent from the tests that no type of cable insulation would be so prolific in gas production in any reasonably conceivable condition of electrical fault as solely to generate sufficient gas for a manhole explosion.

The most common insulating materials used for electrical cables are rubber, varnish, paper, cotton and oil, all of which are organic substances and subject to deterioration by distillation, when raised to elevated temperatures for prolonged periods of time. The kind and quantity of gases so produced are dependent upon the composition of the insulating material. The need for a test to evaluate the explosive characteristics of the gases evolved, when insulating materials are subjected to high temperatures, has been recognized by both public utility companies and cable manufacturers. Realizing this need the American Steel & Wire Company has developed a method for testing and determining the degree of explosibility of gas.

While it is remotely possible that manhole explosions may result from the distillation of cable-insulating materials, the results of extensive investigation and tests indicate that explosions attributed to this cause are due to gases originating from other sources than cable insulations.

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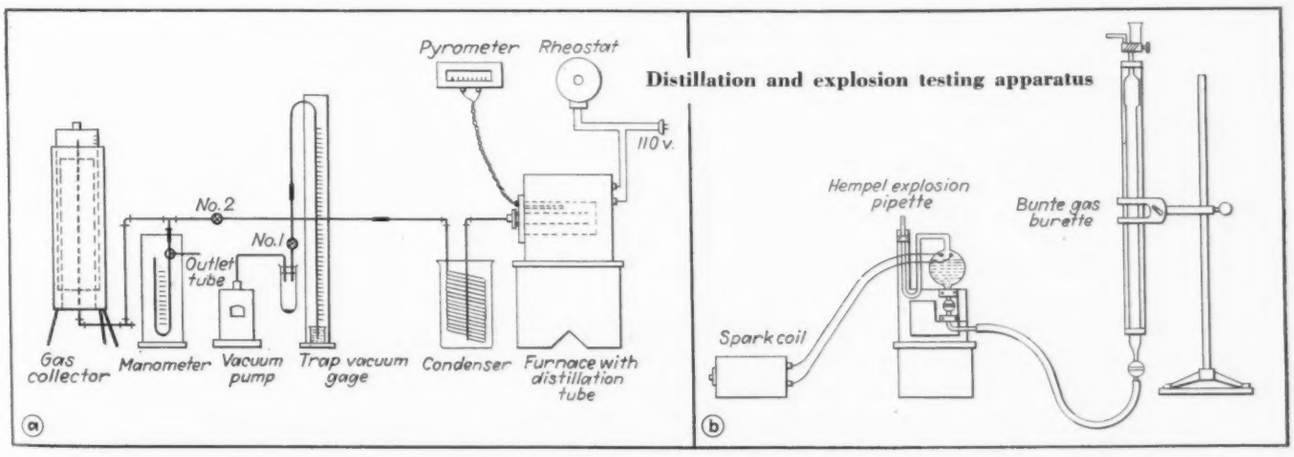
After considering the type of apparatus best suited for performing the tests, it was decided to design and construct a laboratory apparatus which would duplicate, as nearly as possible, the conditions actually existing in a cable duct, subway or manhole. The apparatus adopted consists, briefly, of a closed container for distilling the insulating materials, a gas collector for collecting the evolved gases at atmospheric pressure, and suitable equipment for mixing measured quantities of gas and air, and exploding the mixtures by means of an electric spark. These conditions are

[*Continued on page* 86]



Distillation and explosion testing apparatus

The electric furnace is a small, open-wound resistance type furnace, having a maximum temperature range of 2,000 deg. F. Distillation tube is a clear, fused quartz test tube, 6 in. long and ¾ in. outside diameter, closed at one end. Condenser is a coil made of ¼-in. copper tubing. Coil has an outside diameter of 3 in. and consists of fifteen turns, spaced ¼ in. apart. Vacuum gage is the customary inverted U-tube type. The manometer is a U-tube, using water as an indicating medium in the arms of the tube. Gas collector is made of stainless steel, welded construction. Mercury is used as the gas seal. Vacuum pump is the ordinary laboratory type. The Hempel explosion pipette is standard equipment for gas analysis. The Bunte gas burette is also standard equipment in gas analysis.

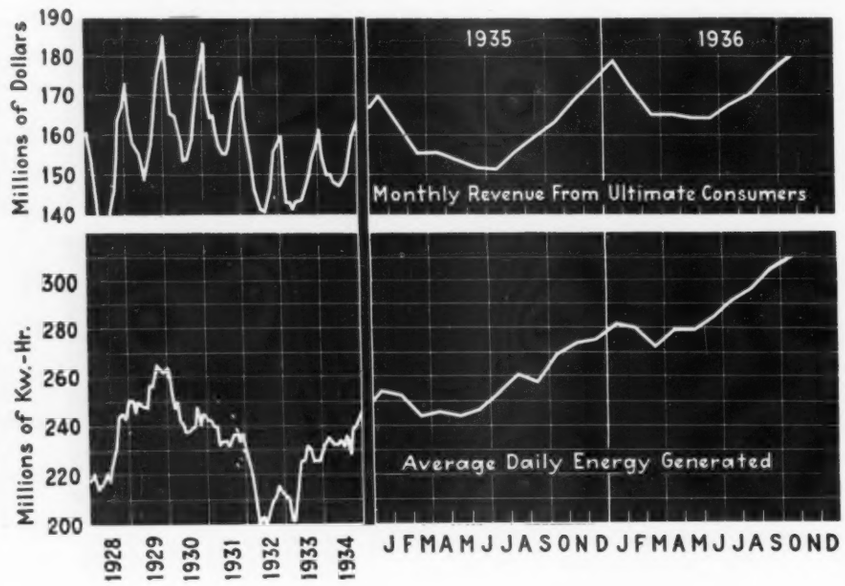
Gas Productions and Explosive Proportions

Material Tested	Volume of Gas C. C. per Gram	Explosive Limits Per Cent of Gas in Total Gas and Air Lower Limit	Upper Limit
Oil impregnated paper	335	3.2	28.7
Factice (rubber substitute)	482	13.7	14.3
Rubber compound (ordinary)	347	11.3	20.1
Rubber compound (special)	215	23.0	30.3

Utility Rise Continues

October sales 18.6 per cent over 1935, revenue up 10.6 per cent, set new records despite falling rates

CENTRAL-STATION energy production and revenue followed the usual pattern in October, both rising strongly compared with the preceding year, but with the dollars showing a smaller gain than the kilowatt-hours. That is, the average rate for energy continues to decrease. Measured by either standard, operations were on a larger scale than in any previous October in the history of the industry. Revenue rose to $179,972,300, 10.6 per cent above the like figure in 1935, according to the Edison Electric Institute. Output mounted 15.3 per cent to 9,638,500,000 kw.hr., the largest ever attained in any month. Both quantities moved up seasonally compared with September—revenue by 2.5 per cent, output by about 5 per cent. Revenue was exceeded only in the two midwinter peaks of January 1930 and 1931.



Production from water power returned to more nearly normal proportions, this item constituting about 33 per cent of the total, after the unusually low ratios recorded during the preceding dry months. The demands on steam plants moderated correspondingly, the output of these latter being only slightly greater than in September and 14 per cent above a year ago, against 17.6 per cent for hydro.

Energy sales increased in all classes, the most noteworthy gain being in wholesale commercial service. This group absorbed 57 per cent of all the energy sold to ultimate consumers and the increase over a year ago of nearly 23 per cent bears witness to the growing activity of manufacturing plants. Also, it indicates a steady advance in electrification, since kilowatt-hour consumption broke all former records while industrial production figures are, in general, still below pre-depression levels.

Retail commercial sales 16.5 per cent higher than a year ago and domestic energy sales up 11.7 per cent are other indicators of progress. Average use per domestic customer for the twelve-month period rose to 714 kw.-hr. from 663 kw.-hr. a year ago.

Table I—Monthly Revenue from Ultimate Consumers and Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1936	Revenue from Ultimate Consumers†		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
October	179,972	+10.6	9,639	+15.3	3,137	+17.6	6,502	+14.2
September	175,597	+10.4	9,177	+18.8	2,736	—2.2	6,441	+30.5
August	169,630	+8.7	9,178	+13.8	2,756	—10.7	6,422	+28.7
July	167,672	+10.9	9,067	+15.6	2,832	—14.8	6,235	+38.1

Table II—Regional Revenue and Energy Output in October, 1936

Compared with Corresponding Month of Previous Year

Geographical Region	Revenue from Ult. Consumers		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
United States	179,972	+10.6	9,639	+15.3	3,137	+17.6	6,502	+14.2
New England	15,257	+10.0	645	+8.3	236	+35.0	409	—2.6
Middle Atlantic	50,453	+9.7	2,434	+17.4	524	+13.9	1,910	+18.5
East No. Central	40,862	+8.7	2,330	+14.5	157	—3.2	2,173	+15.8
West No. Central	15,352	+9.0	618	+17.5	131	+19.7	487	+17.0
South Atlantic, East So. Central	25,023	+19.6	1,212	+19.3	612	+50.0	600	—1.3
			359	+20.0	278	+57.0	81	—33.2
West So. Central	10,098	+13.1	473	+16.5	13	—22.0	460	+18.3
Mountain	5,204	+6.8	362	+20.0	256	+17.0	106	+28.1
Pacific	17,723	+7.1	1,206	+10.0	930	—1.0	276	+75.0

* By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central station.
† Edison Electric Institute.

Table III—Allocation of Energy October, 1936

Compared with Corresponding Month of Previous Year
(Edison Electric Institute)

Class of Service	Millions of Kw.-Hr	Per Cent Inc.
Total for distribution*	9,670	+15.3
Lost in transmission, etc.	1,577	+0.8
Sold to ultimate consumers	8,093	+18.6
Domestic	1,324	+11.7
Com'l, small light and power	1,421	+16.5
Com'l, large light and power	4,574	+22.8
Municipal street lighting	214	+3.3
Railways—street, interurban	374	+3.9
Railroads—electrified steam	110	+50.2
Municipal and miscellaneous	76	+49.9

* Generated, purchased from other sources, imported, less energy used in railway and other departments.

Mercury-tungsten units of 1,200 watts combined rating, each luminaire having a separate switch, provide 33 to 40 ft.-candles on drafting boards and supply within 10 per cent of daylight value. Venetian blinds facilitate accurate control of daylight when used in conjunction with fixtures

By E. C. ALGER
Chief Electrical Draftsman,
Bethlehem Shipbuilding Corporation,
Fore River Plant, Quincy, Mass.

Mercury Tungsten Lighting Aids Shipyard Draftsmen

Fore River Plant Utilizes 33 to 40 Ft.-Candles in Drafting Room — Closely Approximates Daylight Color Characteristics

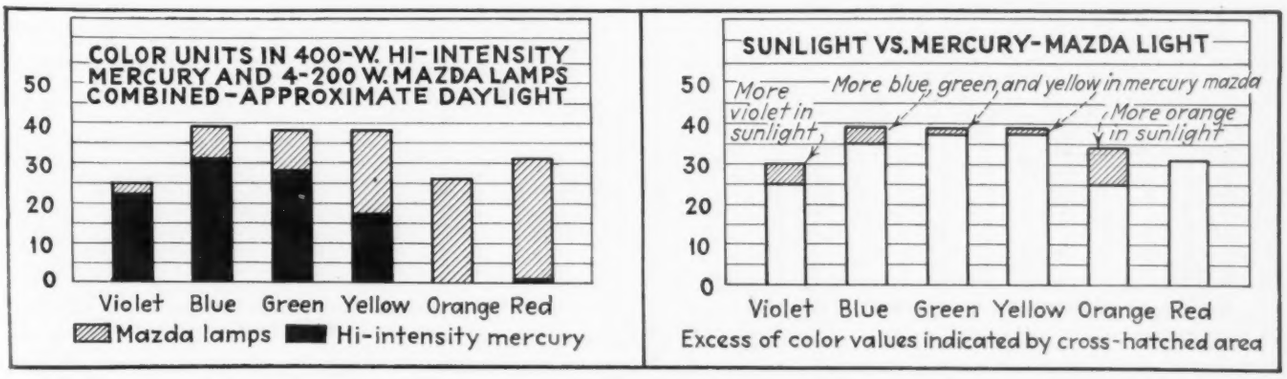
DUE to the large volume of naval and merchant marine work that the Bethlehem Corporation has been carrying on, it considered it advisable to increase as well as recondition its drafting rooms, realizing at the same time that it was a good investment to do everything possible to increase the efficiency of these departments in order to get the plans out in time for orderly construction of the ships.

In considering the new addition to the drafting rooms the importance of providing sufficient artificial lamps with comfortable seeing under all conditions for the close visual tasks of drafting was considered. This illumination would supplement daylight with its various degrees of intensity and also be adequate for twilight and night-time use.

Our representatives visited many of the largest drafting rooms in the East and studied the methods, fixtures, designs, operations and results. It was found that the majority were illuminated by either the direct method or semi-indirect method using diffusing globes. In most cases considerably under 20 ft.-candles was obtained on the drafting tables. This lighting was supplemented by local lamps.

Some years ago we installed a system of direct lighting in metal reflector diffusing globe units, which at the time was considered the best for a beam ceiling of low reflection factor. Its inherent weaknesses were the specular reflections over the tracing cloth, shadows and predominant yellow color which did not mix well with daylight, especially during the late afternoons of the winter months. The advent of new lighting sources, the reflecting mediums with equipment and design of the best appearance architecturally, interested us in their possible application to our problem.

Tests were made of aluminum indirect troughs carrying 200-watt daylight lamps on 12-in. centers, as it was felt that such construction would perhaps present the best appearance. This proved impractical due to maintenance, operating cost and low efficiency. [*Continued on page 95*]



Color components of high-intensity mercury and tungsten unit compared with sunlight
Left—Ratio of color units in mercury and tungsten lamps. Right—Excess of color units in adopted lighting unit or in sunlight.

Less Operating Difficulties,

Capacitor Installation and New Switchboard Count for More in Operating Smoothness Than Do Mere Dollars Saved in Power Bill

Cold dollars of outlay contrasted with a reduction in the monthly power bill too often obscure other equally real benefits from modernizing the electrical equipment of an industrial plant. Here is a case where the pure power economics of power-factor correction justified only about 22½ per cent of what was spent to eliminate losses from operating interruptions, over-heating of equipment, poor garment production speeds and other nuisances.

TESTS made before business slumped indicated that the H. D. Lee Mercantile Company's plant could very profitably spend some money to boost power factor from 45 to 97 per cent. Like thousands of similar cases, the management put the proposals on the table until recently. Now it has completed a modernization program which:

1. Changed motors from slow speed to high speed to get better efficiency, better power factor, better production.
2. Put in 90 kva. in capacitors which raised power factor from 45 to 98 per cent, reduced losses.
3. Included a dead-front circuit breaker switchboard that eliminated loss in operating time from blown fuses.
4. Rearranged feed-in and distribution circuits to facilitate control and reduce losses.
5. Released tied-up capacity in transformer and circuits so that plant operations may be increased nearly 50 per cent without further service investment.

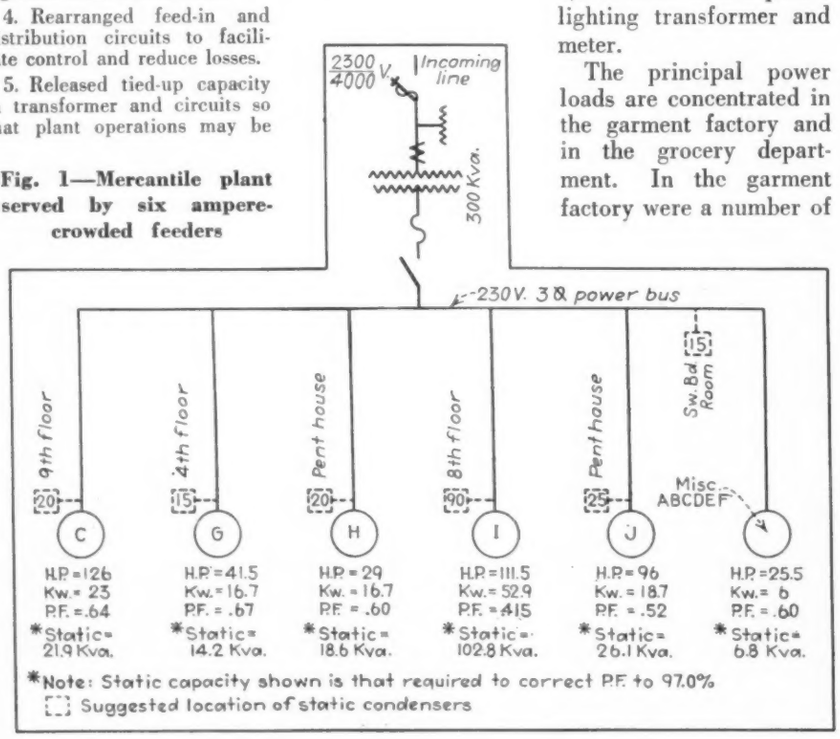


Fig. 1—Mercantile plant served by six ampere-crowded feeders

The Kansas City unit, in addition to general offices and warehouse, includes factory equipment for overall manufacture, coffee roasting, spice making, as well as the preparation of several other food products. For many years all power requirements have been purchased from the local utility.

Oil-fired boilers are used for process steam and for building heating except in the pressing room, where a small automatic gas-fired boiler is used. Electric service is supplied at primary three phase, 60 cycle, 2,300/4,000 volts with separate lighting transformer and meter.

The principal power loads are concentrated in the garment factory and in the grocery department. In the garment factory were a number of slow-speed motors directly connected to line shafts driving sewing machines. Power factor on feeders ranged from 41½ to 67 per cent.

For many years difficulty had been encountered by the customer from two sources—the old fused switchboard, with its secondary fuses, was the source of much inconvenience and many outages due to excessive current; also, at the various distribution centers the same trouble was a source of continuous annoyance. Tests made by the General Electric Company and the Kansas City Power & Light Company engineers showed that either larger feeders and switches must be installed or additional distribution feeders provided unless power-factor correction be used to reduce the feeder current. Table I shows the summary of the principal test data accumulated before recommendations were made. Fig. 1 shows the general layout of the power feeders.

Decision favored capacitors

From the test data calculations were made to determine the sizes of capacitors necessary. Table II shows the results of those calculations. It was estimated that power-factor correction as calculated would result in a reduction of from 5 to 6 kw. in the demand and a saving of from 12,000 to 20,000 kw.-hr. per year. This, of course, represented reduced heating in the transformers and feeders.

The final decision to recommend capacity correction was due to the following factors:

1. With only 60 kva. in excess transformer capacity available, in view of the growth in load or possible loss of one transformer, it was advisable for the customer to provide additional transformer capacity. This could be done by increasing the size of the transformers, but space limitations in the transformer vault would have made it an expensive step. Power-factor correction would add capacity while correcting other troubles.
2. Enlargement of the present distribution feeders would have meant either expensive overtime work or interruption of factory op-

Bettered Power Factor

By B. J. GEORGE *
Industrial Engineer
Kansas City Power & Light Company

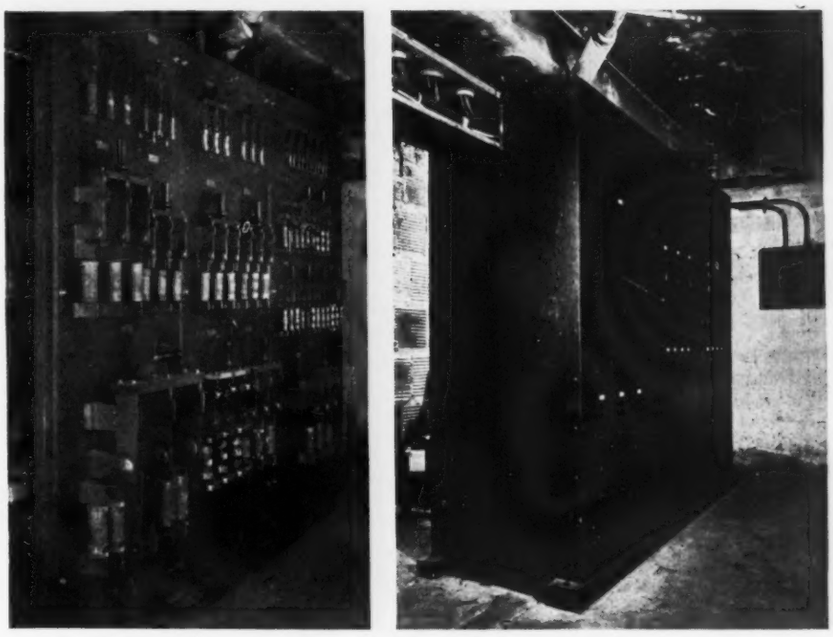
eration, while the installation of new feeders would have entailed no small expense.

3. Installation of capacitors would eliminate heating, reduce losses and increase available reserve transformer capacity at a minimum outlay.

Job undertaken this year

Early in 1936, with improving business conditions, the customer decided to take steps to overcome its power distribution difficulties. Consequently, the power company and the equipment company engineers, co-operating with a local contractor, presented several proposals.

These proposals covered estimates for changing over to 13,200-volt primary service as an alternative to remaining on the 2,300/4,000-volt service. They also included installing a new switchboard as an alternative to the old fusible type switchboard.



Dead-front replaces live-front board

Although a credit for power factor is allowed on the 13,200-volt rate (none on the present rate), the excessive investment for the new transforming equipment made the retention of the present voltage and rate more economical.

To modernize the old switchboard would have meant an outlay of $1,600;

* In co-operation with L. E. Evans and R. W. Ryan of the General Electric Company and G. A. Jennings of the K. C. P. & L. Co.

Table I—Summary of Test Data Before Modernization of Power Bank

Circuit	Circuit Capacity, Amp.	Avg. Max. Amp. 2 Hours	Momentary Peak, Amp.	Avg. Volts at Switchboard During Oper. Periods	Avg. Volts at Load End of Feeder During Oper. Periods	Avg. Power Factor, Per Cent	Heating Condition
Power transformer.....	750	602	915	227	...	45	Excess heat in vault
Main feeder.....	1,000	602	915	227	...	45	All fuse clips hot
Feeder C.....	275	90	125	227	222	64	
D.....	125	Less than 10	30	227	227	..	
G.....	225	62.5	72.5	227	225	67	Two fuse clips hot
J.....	450	90	480	227	223	52	One fuse clip hot
I.....	400	320	460	227	219	41.5	All fuse and switch clips hot
H.....	175	70	220	227	222	60	Two fuse clips and one switch clip hot

Voltage regulation on main power bus is 225 to 227 volts or 5.2 per cent.
Voltage regulation on feeder "I" to garment factory is 237 to 218 volts or 8.3 per cent.
Voltage regulation on feeder "G" to ice machine is 237 to 224 volts or 5.7 per cent.

Table II—Loads and Tentative Distribution of Capacitors Based on Final Power Factor of 97 Per Cent

Circuit	Connected Load, Hp.	Present Average Maximum 2-Hour Kva. Load	Present Average P.F., Per Cent	Present Average Maximum 2-Hour Kw. Load	R.-Kva. Required	Proposed Average Maximum 2-Hour Kva.	Circuit Kva. Saved	Nature of Load
C.....	126.0	35.9	64	23	21.9	23.7	12.2	Grocery Dep't, 9th floor
G.....	41.5	24.9	67	16.7	14.2	17.2	7.7	Ice machine
H.....	29.0	27.9	60	16.7	18.6	17.2	10.7	Passenger elevators
I.....	111.5	127.5	41.5	52.9	102.8	54.6	72.9	Garment factory
J.....	96.0	35.9	52.0	18.7	26.1	19.3	16.6	Freight elevator, tube system, fans, etc
A, B, D, E, F*...	25.5	10.0	60.0	6.0	6.5	6.2	3.8	Miscellaneous
Plant.....	429.5	240.0†	45.0	108.0	187.0	111.3	128.7	Total power

* Total load and power factor on circuits A, B, D, E and F estimated. † Total transformer capacity, 300 kva.

to provide a new switchboard with three circuit breakers and sixteen sets of fused switches would have cost $1,900, whereas to provide a completely dead-front circuit-breaker switchboard would have cost $2,600. The customer immediately decided on a new board, and after some study of the past record of feeder outage time and cost of fuse renewals the board completely equipped with circuit breakers was purchased.

When the question of final selection of capacitors was brought up, it was decided to replace fifteen 3-hp. and seven 5-hp., 450-r.p.m. motors with fifteen 3-hp. and seven 5-hp., 1,800-r.p.m. motors. The old motors were direct connected to the sewing machine line shafts, but the new ones were equipped with V-belt drives. This not only improved the power factor but increased the over-all efficiency. The smaller space occupied by the smaller motors with their drive reduced the congestion under the sewing machine tables.

Capacitors distributed advantageously

With the improved power factor resulting from the motor changes it was recommended that 90 kva. in capacitors be installed. Orders were immediately placed for this equipment. The capacitors, in 5-kva. units, were distributed at various places on the feeders, as follows:

Circuit C	25
Circuit J	25
Circuit I	30
Circuit D	5
Circuit H	5
	90 kva.

At the time of the negotiations the advisability of automatic control equipment to avoid excessively high voltages at feeder ends during periods of light loads was considered. However, it was thought to be more economical, for the present at least, to eliminate this expense and open the switches on the feeders after the factory work is over for the day. This has proved successful and eliminates the feeder loss due to the high leading current during the night.

As soon as the equipment was installed check tests were made by the power company to verify the results. Those tests show that everything an-

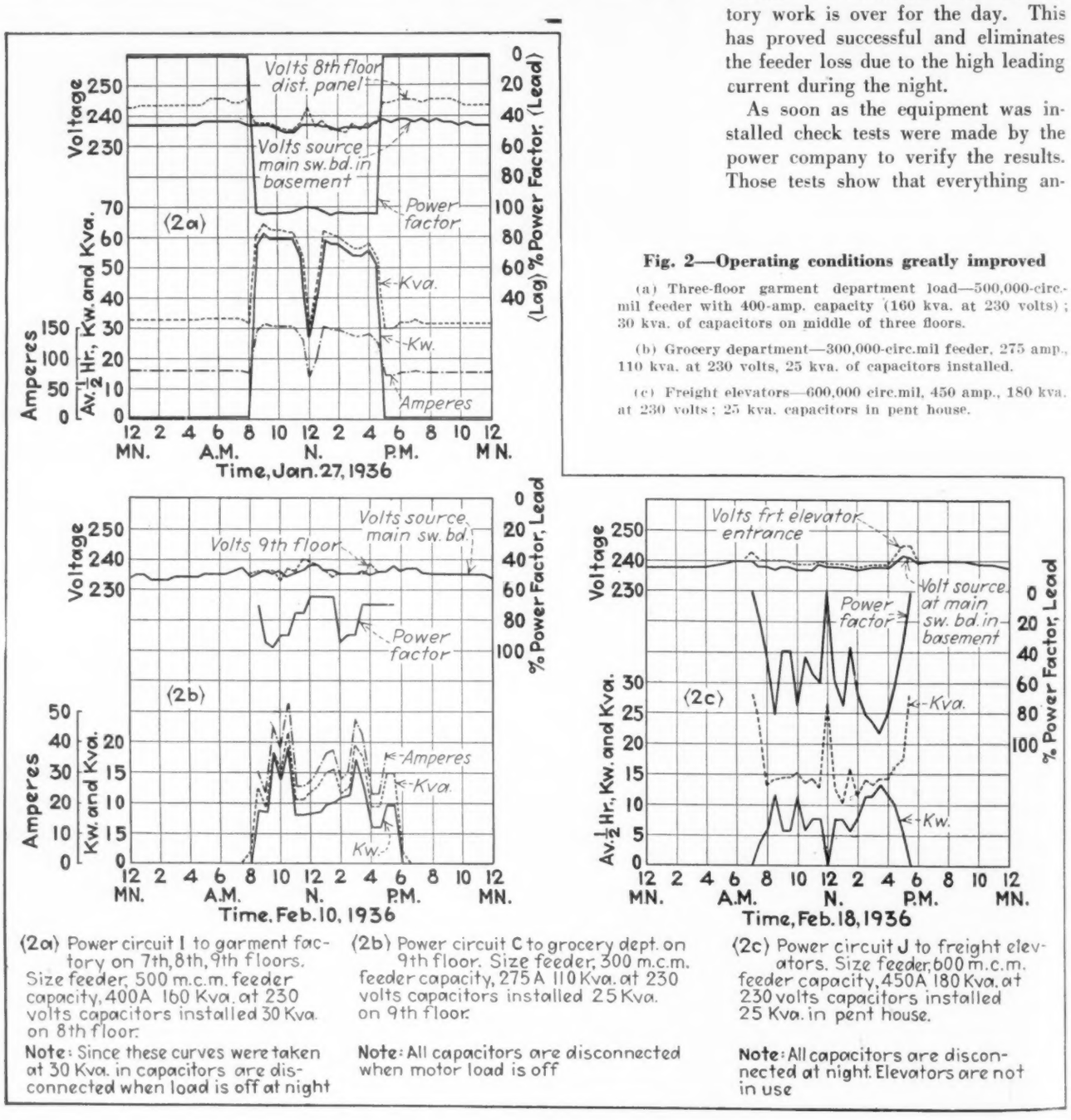


Fig. 2—Operating conditions greatly improved

(a) Three-floor garment department load—500,000-circ.-mil feeder with 400-amp. capacity (160 kva. at 230 volts); 30 kva. of capacitors on middle of three floors.

(b) Grocery department—300,000-circ.mil feeder, 275 amp., 110 kva. at 230 volts, 25 kva. of capacitors installed.

(c) Freight elevators—600,000 circ.mil, 450 amp., 180 kva. at 230 volts; 25 kva. capacitors in pent house.

(2a) Power circuit I to garment factory on 7th, 8th, 9th floors. Size feeder, 500 m.c.m. feeder capacity, 400A 160 Kva. at 230 volts capacitors installed 30 Kva. on 8th floor.

Note: Since these curves were taken at 30 Kva. in capacitors are disconnected when load is off at night

(2b) Power circuit C to grocery dept. on 9th floor. Size feeder, 300 m.c.m. feeder capacity, 275 A 110 Kva. at 230 volts capacitors installed 25 Kva. on 9th floor.

Note: All capacitors are disconnected when motor load is off

(2c) Power circuit J to freight elevators. Size feeder, 600 m.c.m. feeder capacity, 450A 180 Kva. at 230 volts capacitors installed 25 Kva. in pent house.

Note: All capacitors are disconnected at night. Elevators are not in use

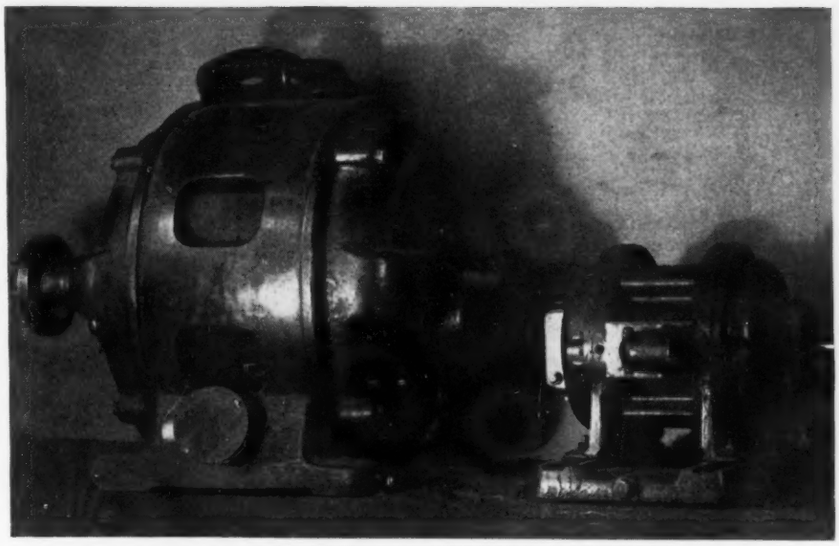


Fig. 3—High-speed hare wins space race from slow-speed tortoise

ticipated was accomplished, although the growth in load and usage since the change has made it difficult to show these in the billing demand and consumption.

Amperes nearly halved

The changes resulted in a reduction of the load on the primary side of the 300-kva. bank from 240 kva. down to 130 kva., with a power-factor improvement from 45 per cent lag to 98 per cent lag. The total load amperes were cut from 600 amp. down to 315 amp., with an estimated reduction of about 6 kw. in the total losses in feeders and transformers. The increase in reserve transformer capacity brings the reserve from 60 up to 170 kva. This is sufficient for all present and estimated future requirements.

The kva. load on feeder I to the garment factory was reduced from 126 kva. at 41 per cent power factor to 65 kva. at 96 per cent power factor. The values on other feeders were changed accordingly. The voltage drop on all feeders is now negligible. Fig. 2 shows the test results on feeders I, C and J. A comparison of the 1929 total load conditions, before the change, with 1936, conditions, after the change, shows graphically what was accomplished.

The installation of the new equipment has eliminated heating, while the new switchboard has solved the problem of quick restoration of service on a feeder after an interruption. Since the change few have been the interruptions.

This piece of modernization is of interest particularly because the customer was induced to make an outlay of about $8,000, although a mere consideration of the reduction in the power bill, load conditions remaining constant, would not have justified the investment. In brief, the reduction of 6 kw. in the demand and a saving of 12,000 to 20,000 kw.-hr. in losses (amounting to a power cost saving of from $225 to $300 per year) justified only $1,500 to $2,000 of the total expenditure. On the other hand, the many other factors enumerated in this article and discussed with the customer made the balance of the expenditure a wise investment.

Since the change was made the customer has installed a modern lighting layout and has rebuilt the ventilating system in the general office.

R. B. Caywood, vice-president of the H. D. Lee Company, with the assistance of its engineer, L. D. Shepherd, handled negotiations for his company. The company also operates factories in South Bend, Ind.; Trenton, N. J.; Salina, Kan.; Minneapolis, Minn., and San Francisco, Calif.

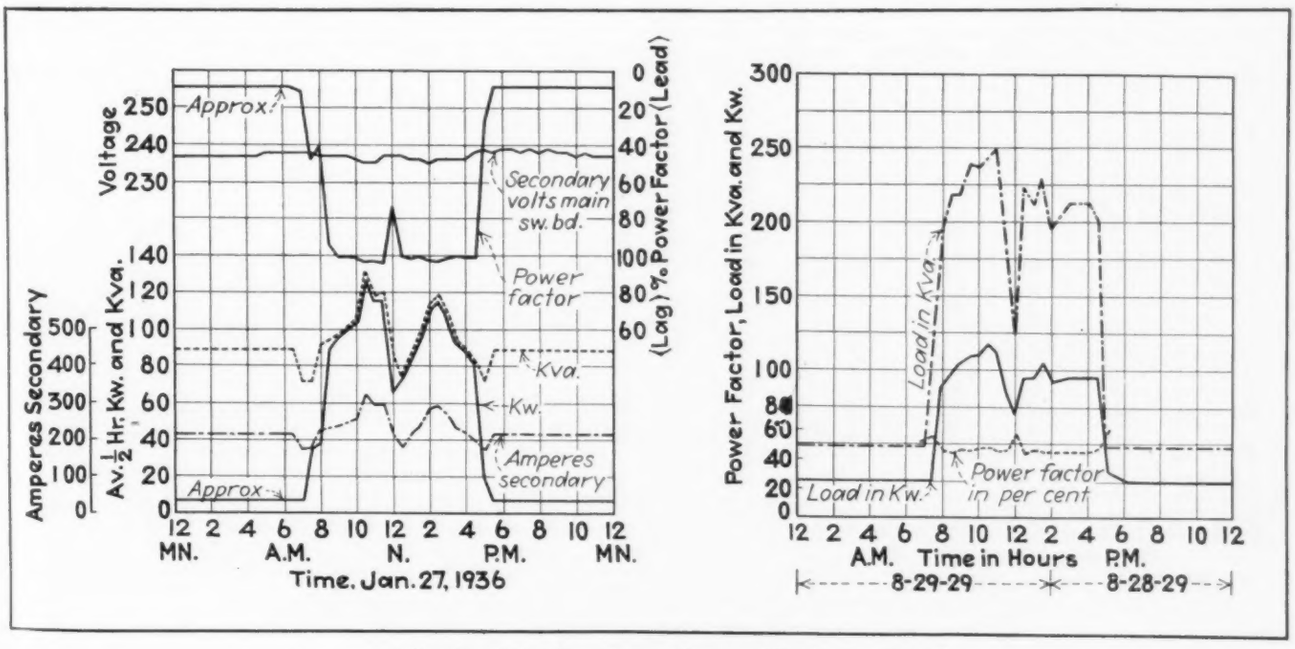


Fig. 4—Gain from correction readily demonstrated

(a) New results far superior to the old (b)

Choosing Transformer Sizes for Distribution Circuits

New Technique of Puget Sound Power & Light Company Utilizes Existing Data, Eliminates Expensive Load Checks and "Spot" Tests, Insures Selection of Correct Size of Transformer for Distribution Loads and Saved Company More Than $20,000 During 1935–36

By R. RADER
Assistant Engineer Puget Sound Power & Light Company, Seattle, Wash.

DETERMINING the specific size of distribution transformer to use at a given location for a customer or group of customers is a problem closely allied with the one of periodically determining the degree of loading of the transformer so that the correct amount of transformer capacity may be kept installed. The root of the problem lies in the difficulty of obtaining correct information on the load to be served. Knowledge of the connected load, when available, may give a valuable clue, but a large element of guesswork still remains as to the length and duration of the peak. The taking of load charts on small transformers eats too deeply into the revenue if taken sufficiently frequent to be of value. "Spot" readings are too costly for the meager information they show. Left in the twilight, the field engineer is forced into a liberal policy in selecting transformer sizes, so that surplus transformer capacity is the more general condition found when checking the total feeder load against the total transformer capacity installed on the feeder.

To obtain quick, inexpensive and reasonably accurate data on the type and magnitude of the load to be served at a specific location the Puget Sound Power & Light Company has developed a new method of procedure which has proved practical and profitable. Briefly, the method consists of converting certain known or easily obtained information into demand data, then applying the current transformer size to carry this demand.

The first step required the compilation of load curves for various combination of range, water heating, light and small appliance loads as applying to groups of customers ranging from a single customer up to the maximum number generally served from a single transformer. Company charts, together with published data on this subject, were used in this compilation. The peak load on the typical distribution transformer is of relatively short duration, so that the required individual transformer capacity is considerably less than the peak load on the transformer. The

Form No. 1

DISTRIBUTION TRANSFORMER MONTHLY KW.-HR. CONSUMPTION

Date

Tariff Schedule No.

Customers, segregated by transformers	Route and acct. no.	Kw.-Hr.	Kw.-Hr.	Kw.-Hr	Kw.-Hr.	Kw.-Hr.	Kw.-Hr.	Kw.-Hr.	Kw.-Hr.	Kw.-Hr.	Kw.Hr.

Circuit No.....Block No.....

Form No. 2

LOADING DATA—SUMMARY SHEET Circuit No.

Existing transf.		Block no.	No. of equiv. ltg. cust's	No. of equiv. range cust's	No. of equiv. off peak W. H cust's	Trans. capacity in use Kva.	Extent trans. is loaded %	Trans. size required	Description of actual changes made	Date
Co. no.	Size									

amount of transformer capacity required was determined from several sources, including published data on the safe loading of transformers and the company's own experience. Correction was made for ambient temperature, which showed conclusively that the heaviest duty on the transformers occurs during the cool winter months, when the heavier load more than counterbalances the higher ambient summer temperatures. Transformer requirements for various load groupings are shown in Tables I and II. The water heaters of Table I are of the automatic, off-peak type. Since the lighting load is near its peak when the range load is at its peak, the transformer capacity required is found by adding together the two figures, one from each table.

Tables III and IV in combination show the actual standard size transformer which should be used. This size is determined by using the transformer next larger in size than the kilovolt-ampere figure obtained from Tables I and II. Generally this automatically allows a sufficient spare transformer capacity for load growth, but an additional allowance could be made if immediate heavy load growth is anticipated.

The foregoing explains the scheme in principle. Actually the data on

[*Continued on page* 87]

Table I—Transformer Capacity in Kva. Required for Ranges and Water Heaters

Number of Ranges	0	1	2	3	4	5	6	7	8	9	10
10	10.8	10.8	10.8	10.8	11.5	11.5	12.1	12.7	13.2	14.4	15.0
9	10.1	10.1	10.1	10.1	10.8	10.8	11.4	12.0	12.5	13.7	14.3
8	9.6	9.6	9.6	9.6	10.3	10.3	10.8	11.4	12.0	13.1	13.7
7	9.0	9.0	9.0	9.0	9.6	9.7	10.2	10.8	11.3	12.5	13.1
6	8.4	8.4	8.4	8.4	8.9	8.9	9.5	10.1	10.9	11.8	12.4
5	7.8	7.8	7.8	7.8	8.3	8.3	8.8	9.4	10.9	11.6	12.4
4	7.2	7.2	7.2	7.8	7.8	7.8	8.2	9.0	10.9	11.6	12.4
3	6.5	6.5	6.5	7.0	7.0	7.0	7.5	9.0	10.8	11.6	12.4
2	5.0	5.5	5.5	5.8	5.8	6.3	7.5	9.0	10.8	11.6	12.4
1	2.5	3.8	3.8	4.5	5.4	6.3	7.5	9.0	10.8	11.6	12.4
0	0	1.8	2.7	4.5	5.4	6.3	7.5	9.0	10.8	11.6	12.4

No. of Water Heaters

Table II—Transformer Capacity in Kva. Required for Lights and Small Appliances

Total customers	1	2	3	4	5	6	7	8	9	10	11	12
Kva. required	0.5	1.0	1.3	1.6	1.9	2.2	2.5	2.8	3.1	3.4	3.7	4.0
Total customers	13	14	15	16	17	18	19	20	21	22	23	24
Kva. required	4.3	4.6	4.9	5.2	5.5	5.8	6.1	6.4	6.7	7.0	7.3	7.6

Instructions for obtaining the size of transformer to use for any number of range, water heater and lighting customers:

1. Locate the figure in Table I corresponding to the number of ranges and number of water heaters;
2. Locate the figure in Table II corresponding to the total number of lighting customers to be served from that transformer, including range and water heater customers;
3. The sum of these two figures represents the transformer capacity required for these customers.

Example: 2 customers have ranges and water heaters
1 customer has range but no water heater
2 customers have lights and appliances only

5 Total customers

3 ranges and 2 water heaters require.....6.5 kva., (Table I)
5 customers require for lighting.....1.9 kva., (Table II)

Total kva. required.....8.4 kva.

Tables III and IV—Transformer Sizes required for All Combinations of Range, Water Heater and Lighting Customers (Including Small Appliances)

Instructions for using the Tables:

1. Find in Table the symbol A, B, C, etc., opposite the number of ranges and number of water heaters to be served, irrespective of the number of customers.
2. Locate this same symbol in the left-hand vertical column of Table IV. Follow along horizontally to the vertical column corresponding to the total number of customers to be served. The figure thus located shows the transformer size required.

Table III

No. of Ranges	0	1	2	3	4	5	6	7	8	9	10
10	O	O	O	O	P	P	Q	Q	Q	Q	Q
9	N	N	N	N	O	O	P	Q	Q	Q	Q
8	M	M	M	M	N	N	O	P	Q	Q	Q
7	L	L	L	L	M	M	N	O	P	Q	Q
6	K	K	K	K	K	K	M	N	O	Q	Q
5	J	J	J	J	K	K	K	M	O	P	Q
4	I	I	I	J	J	J	K	M	O	P	Q
3	H	H	H	I	I	I	J	M	O	P	Q
2	E	F	F	G	G	H	J	M	O	P	Q
1	C	D	D	E	F	H	J	M	O	P	Q
0	A	B	C	E	F	H	J	M	O	P	Q

No. of off-peak water heaters

Table IV—Transformer Size Required

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Q								15	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
P								15	15	15	25	25	25	25	25	25	25	25	25	25	25	25	25	25
O							15	15	15	15	15	15	25	25	25	25	25	25	25	25	25	25	25	25
N							15	15	15	15	15	15	15	15	15	25	25	25	25	25	25	25	25	25
M						15	15	15	15	15	15	15	15	15	15	15	15	15	25	25	25	25	25	25
L						15	15	15	15	15	15	15	15	15	15	15	15	15	15	25	25	25	25	25
K					15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	25	25	25
J				10	10	10	10	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
I			10	10	10	10	10	10	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
H			10	10	10	10	10	10	10	10	10	15	15	15	15	15	15	15	15	15	15	15	15	15
G			7.5	7.5	10	10	10	10	10	10	10	10	15	15	15	15	15	15	15	15	15	15	15	15
F		7.5	7.5	7.5	7.5	10	10	10	10	10	10	10	10	10	15	15	15	15	15	15	15	15	15	15
E		7.5	7.5	7.5	7.5	7.5	7.5	7.5	10	10	10	10	10	10	10	10	10	15	15	15	15	15	15	15
D	5	5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	10	10	10	10	10	10	10	10	15	15	15	15	15
C	3	5	5	5	5	5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	10	10	10	10	10	10	10	10	10	15
B	3	3	5	5	5	5	5	5	5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	10	10	10	10	10	10	10
A	1.5	1.5	1.5	3	3	3	3	3	5	5	5	5	5	5	5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5

No of Customers

(This includes all customers using light, either alone or in combination with ranges, water heaters, etc.)

Editorials

HOWARD EHRLICH . EDITOR

System Reliability Comes to the Fore Anew

MID-DECEMBER brought another complete outage in a major industrial and commercial center. This time it was in Newark, N. J., and the surrounding area; a year ago it was in Manhattan and the Bronx. While both of these were disquieting, there is no occasion for alarm about a prospective epidemic or anything more than honest anxiety either on the part of the utilities in general or their customers. Nevertheless, there should be a firm determination to forestall these interruptions as thoroughly as can be effected within reasonable expense and outlay. This is necessary because our modern mode of living relies at every turn on electricity, and veritably, as the New York *Times* said, the loss of it in a twinkling throws us back a century.

The Newark failure of service, coming so close on the heels of the New York City outage, serves to emphasize the economic hazard to a community that relies so completely on a comprehensive power supply. There is a responsibility on power companies which none want to dodge. Modern service and modern living have been built on electrical reliability, and every reasonable effort should be made to hold the good record of the past.

In fact, the two episodes are pretty certain to revive the A.I.E.E. symposium of seven years ago when the choice of metropolitan system design for maximum reliability and economy was energetically discussed. New York typifies well-segregated sources and a solid distribution network fed at a multiplicity of points from stations relatively free of direct ties to one another. Newark's networks are, on the contrary, served from three substations rather than directly from Essex station (at which the switch failure occurred to precipitate the interruption), which is interconnected with adjacent stations and with the adjoining Philadelphia and Pennsylvania Power & Light systems.

Diametrically opposed in conception, neither scheme seems invulnerable. And it is immaterial whether the ultimate cause in each instance proves to be equipment failure, man failure or inadequacy of fire-fighting facilities. The point is that some protective scheme and system set-up is needed to insure that important city networks always have energy from enough sources to hold the existing load. Losing load on a network involves plain "hell" in getting back into full service because everything has to start up and light up at once after an outage of anything more than a few minutes. The outage is prolonged by the necessity for removing part of the load before system service may be be restored.

Here is a task for the former power systems engineering committee, which has had no equivalent since the N.E.L.A. was disbanded. These two interruptions, falling on systems typifying two contrary schools of thought, would afford ample play for a revival of the group, embracing, as it did, all shades of technical interest from the coal pile to the toaster. Ahead there is also the urgency of more station capacity and more interconnections, and while the committee would be canvassing the matter of metropolitan reliability it could also be reviewing the economic shifts that have taken place in generation, in substations, in competitive power, in distribution, in supervisory and protective systems.

The public cannot afford a pluperfect supply, nor will it condone a substandard service. There is a happy solution that can be found and it will be as soon as its cost in facilities or in improved administration is set against the public cost in lost business, lost hours and lost tempers. It may not be found, however, if the experts focus exclusively on problems confined to the technical fields exemplified by the present committee set-up.

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Bonneville Now Looking for Industrial Load

POLICIES with respect to the disposition of Bonneville power are recommended in a recent report of the Oregon State Planning Board which are extremely interesting because they reflect conditions that will have to be met sooner or later by all government projects. The very size of these projects creates the problem of finding a load for the large capacity that becomes available even at the beginning. All are in sparsely settled territories with wholly unbalanced economies of agriculture, mining and manufacturing. No matter how low the rates, the existing household users cannot reasonably absorb the output, so there comes a time when search for large industries to absorb large blocks of load becomes inevitable.

The Oregon report, recognizing that Bonneville is already approaching that stage, advocates the establishment or immigration of heavy-current-using industry under the lure of cheap power. But the cheapest power rate will be available only at the busbars of the Bonneville plant. Industry elsewhere will have to pay

more in proportion to the distance from Bonneville so as to carry the transmission investment and losses. This forecast policy is in direct contradiction to regulatory policy elsewhere. The trend has definitely been toward equalizing rates all over a company's territory.

For the common weal a public agency is thus supporting on behalf of a public enterprise the same principles which other public agencies have denied to private enterprise. The reason given is that an averaged rate for the whole territory would necessarily make the busbar rate higher than on a mileage basis, and the difference might be enough to fail to attract electrochemical and electrometallurgical industries.

Just how many such industries can be won over until nearby markets are assured, along with favorable relative costs of transportation for raw and finished products, is problematical. Actually, markets and industries to supply them grow up together, and that takes time. If this time proves long Oregon may get impatient. If it then starts proselyting industries from other states it will be interesting to watch the attitude of congressmen faced with supporting federal water power ventures that can only survive by despoiling other districts of their life-blood industries.

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Quality Versus Cost of Industrial Service

RECENT trips through industrial plants of varied types and sizes which rely on purchased energy reveal significant viewpoints on the part of users. Reliability of service is becoming so important that in some processes cost is secondary. Central stations have gained some chemical plant business on the strength of several months' demonstration of service quality rather than on the basis of a favorable price differential between locally generated and purchased electricity.

In a recent representative case a substantial spread was not able in itself to win the industrial customer. The situation called for duplicate feeders from a utility substation served from steam plants of highest reliability, these being severally interconnected and also tied into a regional hydro-electric system which, while useful, was not considered at any time as a source of 100 per cent primary power. The result was possibly two or three interruptions of momentary duration in about three years and a reserve turbine unit in the industrial plant left cold except for planned temporary use.

Inside factory walls one finds intangible values weighing ever more heavily in the scales which determine whether electric service shall dominate production. The automatic control possible in an electric heat-treating department swept everything before it in a prominent machine tool plant. Compact machine drives, including both individual and grouped layouts, concealed motors inside frames of machines, control designed to particular machine operations, new applications of photo-electric cells reveal the auxiliary tasks of electric service in modernized industry which are reaching a degree of customer acceptance never before achieved.

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Madame Perkins' "Rehabilitation" and the Utility Company

JUST before Christmas our Secretary of Labor broke the ice and came right out on the air waves to tell us of the new label to be pinned on "reliefers." As the candid observers of the national scene predicted, relief would pass from an emergency program to a more or less permanent institution. So the people who used to be on relief will remain with us, but, said Madame Perkins, they will be in the process of rehabilitation.

Under any name, these people present a problem to the utility company, one reason being the fact that it is usually unprofitable to render electric service to them. The fact that they will be with us for some time makes them a continuing problem.

These are among the reasons why ELECTRICAL WORLD sought an authority in the utility field to discuss a solution to these problems for the readers, on the basis of facts, however, rather than surmise.

In a preceding issue Austin Monty showed how he cut into the conventional "averages" and bared the facts concealed by the averages. In a later issue he will tell how a proper use of these newly discovered facts became the basis for effective selling to the unprofitable customer, who, coincidentally, is often on relief (or being rehabilitated). These two stories by a competent authority, offer a practical method of attack on an important problem.

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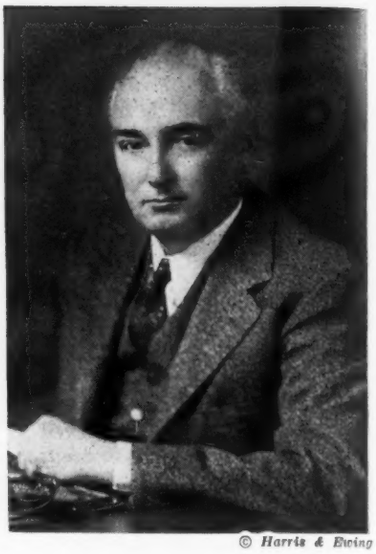
Ammunition for Rural Load Builders

THERE'S sales ammunition buried in the government's final crop reports for 1936. Gross income of farmers for 1936 is $9,530,000,000, says the report. This is about a billion dollars over the 1935 total of $8,508,000,000 and four and a quarter billions above the 1932 total of $5,337,000,000.

The drought exercised no substantial effect after all upon farm income as a whole, as food and feed crops reduced by the drought are now bringing high prices. In fact, based on "averages" the farmer's gross income is $300 higher this year than last. Verily, it would seem time for the rural load builder to strike while the iron is hot.

More Tax Burdens for Utilities

By CARTER FIELD



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This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him.

ANNOUNCEMENT by President Roosevelt that he wants the present tax on electric energy continued would not be significant if his attitude toward the electric industry were not so clear. Despite all the general talk about taking off some of the nuisance taxes there is earnest desire at both the White House and Treasury to hang on to every dollar of tax revenue possible. The only nuisance taxes which may be repealed, and there is not much certainty even about these, is those the collection of which costs the Treasury so much that they are of dubious value.

And these will not be changed, in all probability, until their removal can be used to brighten up the picture next time the government decides to ask Congress for more taxes. They will be used to give the general idea of scientific revision, rather than just a plain boost. But boost it will be, so far as net revenues to the Treasury are concerned. Make no mistake about that.

Originally, of course, this particular tax was a revenue only proposition. It was paid by the consumers. The only discrimination against the utility companies lay in the fact that it was *not* levied against municipal plant electrical consumers. In short, it operated to distort the yardstick by which the savings to the public through municipal operation were to be measured.

Then the tax was switched to the companies themselves, thus becoming what was referred to in the late unpleasantness as a hidden tax, though still not applying to patrons of municipal plants. There is no disposition whatever, either at the White House or on Capitol Hill, to change this situation.

Uppermost in the minds of many utility executives and stockholders, however, is not whether any present governmental burden may be lightened, but whether there will be any more of the same. There will be. Just what is next on the program even the President himself is not sure, so it would be idle for any one less informed to become pedantic.

Holding company taxes

The probability is that there will be another blow at holding companies, not only those in the utility field, but all holding companies. There may be an exception in favor of holding companies which are purely investment trusts, but even this is by no means certain. The point is the probable nature of this blow is by the tax route. Some high government officials have told this writer that they expect Mr. Roosevelt to be somewhat disappointed in the tax returns on March 15. Not in the extent of income reported, for, due to the revival in business and the forcing out of dividends by the undistributed earnings tax, individual incomes will be way up. But, some Treasury experts think, a tremendous lot of this income will not be rung up on the Treasury cash registers. They have been going over the figures of dividends reported in previous years, and are amazed to find how many of them are never reported at all, and how many more are reported by persons whose exemptions prevent their paying any tax.

This was said by these officials *after* the President's budget report was made public. They do not mean that the reports on March 15 will show much smaller taxes than the estimates made by the President in that message. The figures for that were furnished by the Treasury in the full knowledge of the situation.

But it so happens that in sending some of these figures back to the Treasury for revision, just before drafting his budget message, the President personally made a few corrections, in his own handwriting. He did not ask to have the figures revised in accordance with his own hopes, but these scribbled corrections showed clearly what was in his mind—what his hopes were!

It should never be forgotten by the electrical industry that the President is not merely punishing some old enemies when he deals with the utilities. In a way, that is water over the dam. But he is tremendously interested in forcing lower rates to consumers.

But what these critics overlook is that President Roosevelt is a magnificent showman. The average citizen simply accepts as a fact that water power is cheaper, that water power is a natural resource belonging to all the people, and that in seizing these natural resources and developing them, in smashing at the holding companies, in attacking big profits the President is fighting a great battle for the little fellow.

And the President is going to keep on fighting that battle. Electric rates in most communities will be reduced, if he has his way, and the odds that he will have his way should be rather long. On that question there is very little doubt that he has and will have public sentiment behind him.

Certainly an overwhelming majority of both House and Senate *are* behind him in fighting toward this objective.

Letters TO THE EDITOR

Isolated Plant Situation in Chicago Misstated

To the Editor of ELECTRICAL WORLD:

I was astonished to read in the November 7 issue of the ELECTRICAL WORLD the article by Carter Field in which he misstates the facts as to isolated plants in Chicago. I wonder where he obtained the information from which he wrote this article. He certainly did not get it here.

We do not deny that the air in Chicago is not as clean as in New York, but this, in our judgment, is due to the fact that Chicago is essentially an industrial city, whereas New York is not. Furthermore, New York uses large quantities of anthracite coal, of which we have none in the Chicago area. The extensive business of the New York Steam Heating Company is also responsible for a great deal of reduction in the making of smoke in New York. We have no such comparable heating distribution in Chicago. Carter Field failed to mention that Chicago is the greatest railway center in the world, there being 27 trunk line railroads entering the city. Obviously, trunk line railroads without local suburban traffic are not very good prospects for electrification, as every one informed on the matter well knows.

We question his accuracy in saying that coal is burned more economically in New York. He says: "In Chicago most of the hotels and many of the office buildings not only have their own heating plants but they have their own electric-generating plants." There are only three plants in hotels in downtown Chicago. There are about 900 hotels in Chicago and only six of the total have isolated plants, and three of the six use our service during the summer. So far as office buildings are concerned, there has not been a plant installed in Chicago in more than twenty years. We have practically all of the business.

This unfair article relative to electricity use in Chicago from central station supply should have a statement from Mr. Field after he ascertains the facts. Certainly we would like the ELECTRICAL WORLD to correct these statements.

E. W. LLOYD,
Vice-President
Commonwealth Edison Company,
Chicago, Illinois

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Loeffler Boiler Installations in Europe

To the Editor of ELECTRICAL WORLD:

The issue of ELECTRICAL WORLD dated October 10, 1936, contains a news item entitled "Foreign Steam Plant Uses New Principle." This article actually reports on the two Loeffler boilers (steam pressure 2,000 lb., superheat temperature 935°F.), each boiler having a capacity of 60 tons of steam power and being fitted with pulverized fuel equipment. They were built by the M.A.N., our German licensee.

I was not only surprised, but find it also very strange, that ELECTRICAL WORLD completely leaves out the name of these boilers and acts as if something completely unknown has taken place in Leverkusen. Every engineer in Europe knows that the order for Leverkusen has been placed on account of the success of the Loeffler plant erected at the Hoechst Works of the German Dye Trust.

I should be very glad indeed if you would put a supplementary notice in ELECTRICAL WORLD giving a more exact description of the Leverkusen Loeffler plant for the German Dye Trust. It will, perhaps, interest you to know that Vitkovice Mines, Steel & Iron Works corporation is building a new Loeffler station in Prague, capital of Czechoslovakia. This station is ordered by the municipally owned "Electrical Enterprises of the capital of Prague." The new power station Prague-Holesovice is situated in the center of the city and not only supplies electric current for the town, but also heating steam for certain parts of the city.

The first Loeffler boiler erected will have a steam pressure of 1,950 lb. and a steam temperature of 950°F. The boiler, having a capacity of approximately 150,000 lb. of steam power, delivers steam to a three-cylinder turbo set. This Loeffler boiler has only two evaporator drums and is fired with the chain-grate stoker system Walther-Vitkovice. Cheap and very inferior coal with a heat value of 6,200 kg. cal. per kg. is used. The combustion air is preheated in the last draught up to 470°F.

The feedwater consists partly of condensation and partly of only chemically prepared river water. The steam circulating pump will be driven by a back-pressure turbine, the waste steam of which will be used for feedwater preheating.

I would appreciate it very much if you would see that the omittance is made good and, perhaps, completed by the notice which I gave you on Prague.

DR. H. LOEFFLER,
Mitchell Engineering, Ltd.,
London, England.

EDITOR'S NOTE—Undoubtedly this clears up any doubt as to the nature of the item which appeared in the issue of ELECTRICAL WORLD of October 10, 1936 (page 64), and in the Electrical Foreign Trade Notes of September 25, 1936 (page 9), published by the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce.

Co-operatives No Match for Small Enterprises

To the Editor of ELECTRICAL WORLD:

An article in the August issue of *R. E. A. News*, entitled "Why Co-op Costs Are Lower," is worthy of comment by the central station industry. The writer, a member of the R. E. A. research staff, describes the commercial practices of a number of small pre-R. E. A. co-operatives. These practices, he implies, are unique with co-operatives, so that the "marked economies in management and service, often effected by ingenious methods . . . Always with the object of making the consumer's dollar go farther" are deemed virtues that are not attained by the privately owned, capitalistic corporations.

The practices he describes concern meter reading, billing and collecting, and he apparently holds the opinion that such functions constitute 99 per cent of all operation. He does, however, in passing, mention such work as "place the crossarms . . . perform other technical tasks . . . and checking the line" as requiring the services of employees of nearby utilities on an hourly basis.

Many obvious comments, especially in regard to the quality of service, depreciation and obsolescence, will be made by public utility men upon reading the article referred to, and need not be repeated here. It is feared, however, that those trained in the larger companies may lose sight of the more fundamental fact that such short cuts as reading, billing and collecting on one call, and working entirely from employees' or officers' homes, etc., were developed by the industry in its early days and are still in vogue, with improvements, among the smaller companies.

It is felt that the industry might well look to its small brothers to provide the answer to the co-operatives' boasted economies. Possibly it is not generally realized that in the New England states alone there are no less than twelve privately owned electric utilities with less than 100 customers each.

Without exception, these systems are rendering a type of service and attendance superior to the average of all co-operatives, and also returning a profit, or living to the owners. Furthermore, they are in no case financed with 3 per cent capital, and in most cases no capital has ever been introduced save the original equity provided by the owner.

When operation on such a scale can be made in order to finance extensions and growth, in addition to supporting its owners, what likelihood is there of any co-operative management approaching it?

"ENGINEER."

News OF THE WEEK

Congress Asked to Appropriate $43,000,000 for T.V.A. Activities

President Roosevelt recommends funds to continue work on Federal power projects — Appropriations totaling $150,000,000 have been spent in construction of six dams and other developments

Congress has been asked to appropriate $43,000,000 for operations of the Tennessee Valley Authority during the next fiscal year. However, the T.V.A. has authority to contract for the expenditure of an additional $5,500,000 to be paid out of future appropriations, bringing the total estimated cost to the government for its operations in the year beginning next July 1 to $48,500,000. The contract authorization of $5,500,000 would permit the purchase of equipment to be installed in dams and power house.

Appropriations for the current year total $39,900,000, but the authority had an unexpected balance of $8,790,-702 from former years. President Roosevelt, in his annual budget message to Congress, stated that there probably would be no unobligated balance to the authority's credit when this fiscal year ends June 30 next.

T. V. A. to spend $54,291,108

For the fiscal year 1938 total T.V.A. expenditures were placed at $54,291,-108, of which an estimated $5,291,108 would be paid from operating revenues of the T.V.A.

Faced with a number of legal actions against expansion of power activities in competition with private utilities, the T.V.A. has put in its budget large expenditures to rush to early completion its numerous power dams to stand as evidence to the extent to which the government has gone into the power business. So far appropriations totaling $150,000,000 have been spent on the construction of six dams, including Norris, Wheeler, Pickwick Landing, Guntersville, Chickamauga and Hiwassee, the construction of transmission lines, soil conservation, and various other activities of the T.V.A.

President Roosevelt recommended an appropriation of $17,043,620 for the widely expanded activities at Guntersville dam and reservoir in Alabama. He said that this appropriation would bring the project to 85 per cent of completion. The appropriation for the current year is $8,370,538 and 1936 expenditures totaled $2,898,008.

Chickamauga Dam

A budget item of $9,758,338 was asked by Mr. Roosevelt for continuation of the Chickamauga dam and reservoir near Chattanooga. The budget for 1937 provided $6,300,000 and 1936 expenditures totaled $2,392,186. It is expected the 1938 funds will bring the project to the half-way mark.

An allocation of $3,842,718 for Hiwassee dam and reservoir on the Hiwassee River was proposed by Mr. Roosevelt. He declared that this amount would provide the second quarter of the work on the development. Cost during this year is estimated at $3,352,179. A total of $254,-867 was expended in 1936.

The recommended appropriation of $8,423,123 for the Pickwick Landing dam and reservoir in Tennessee is estimated to be enough to virtually complete the project. Estimated expenditures this year were $11,508,381 and for last year were $8,334,488.

Other items in the budget for T.V.A. included $135,000 for Wilson Dam at Muscle Shoals, Ala.; $50,031 for Norris Dam in Tennessee, largely for legal costs on lands still in condemnation, and an additional $32,268 for betterments and additions; $44,985 for Wheeler Dam, and an additional $41,985 for acquisition of land and minor construction; $3,606,600 for fertilizer and soil conservation program; $225,734 for the T.V.A. national defense plan and $357,242 for regional studies, experiments and demonstration.

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Alabama Power Sets Budget at $3,700,000

Alabama Power Company has set aside a budget of $3,700,000 for improvement and expansion of service during 1937. Most of this sum will go into new lines and station facilities. More than 1,000 miles of rural lines will be built to serve approximately 4,500 additional customers. The company estimates that 8,200 new customers will be added during the year to existing and new lines, of which 6,650 will be rural customers. Average total customers during the year is estimated at 121,000.

One interesting item in the budget provides for the construction of a new distribution system for the Resettlement Administration Village at Trussville, Ala., where a town of 400 residences is being built. A new 110-kv. transmission line will be built from Mobile to Gulfport, Miss., also a new 110-kv. transmission line from Gorgas steam plant to Tuscaloosa.

Expenditures for improvement of existing facilities include $550,000 for substations, $406,000 for transmission lines, $175,000 for generat-

ing plants and some $300,000 for miscellaneous items. Increased use will require enlargement of supply facilities for Mobile, Anniston and Phenix City. A new 30,000-kva. transformer bank at Gadsden steam plant is called for.

The company expects an increase in energy sales during 1937 as during 1936. Estimates call for additions to the lines during the year of 4,350 electric ranges, 3,000 water heaters, 12,000 refrigerators and 150 air-conditioning systems.

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T.V.A. Files New Appeal

An appeal from an injunction received by nineteen utilities from District Judge John J. Gore of the Middle Tennessee District has been filed with the Sixth United States Circuit Court of Appeals by attorneys for the Tennessee Valley Authority.

The T.V.A. requested the court to set aside the temporary injunction, maintaining it in a state of *status quo* pending final determination of the suit of the utilities. It was asserted by the T.V.A. that as a going concern it would suffer injury if it were prevented from expanding its services.

Federal Power Policy Assailed in Report of House Committee

Buchanan investigation reveals no policy has been evolved to protect national investment and to guide operations — Proposes Congress take necessary steps to insure uniformity of rates and administration

Failure of the government to evolve a policy to provide adequate protection for national investment or definite guides to be followed in administering the numerous federal power projects was sharply assailed in the report of the special House committee, headed by Representative Buchanan, Democrat, of Texas. When the findings of the committee were published in reports from Washington quick action was taken to temper them before submitting the final report to the House.

The original report pointed out that "no policy has yet been evolved to provide adequate protection to the national investment in, or definite guides to be followed by, administrative agencies concerned with commercial power operations of the federal government. The result appears to be such a lack of uniformity among the different projects in the matter of rates charged for commercial power that the government is, or, in the long run, will be, competing with itself."

Small areas subsidized

The committee's investigator, Col. C. C. Wren, was even more emphatic in stressing the imperative necessity of dealing with a power rate policy, now subject to determination by fifteen or twenty federal agencies all dealing with power.

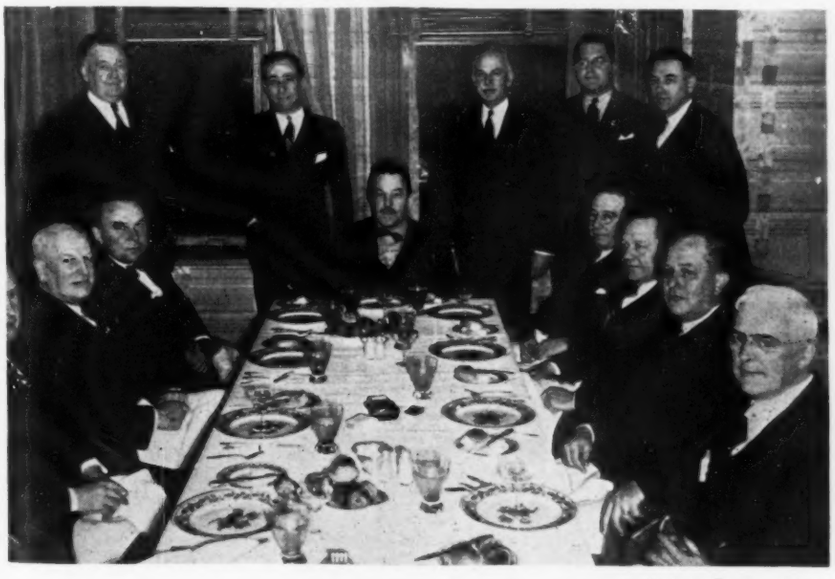
The report pointed out that "Congress has indicated that power facilities must be self-maintaining and self-liquidating, but under existing conditions the federal government is virtually subsidizing the production of electric energy for relatively small areas of the country, with no provisions for ascertaining accurately the cost of construction or operations, period of amortization (or to prevent federal plants from competing with each other)."

It was also stated that "the government has been engaged in commercial power operations for thirty years with no policy yet evolved" to guide operations or protect the national investment.

Urges Congress act

The report proposed that "in order to protect the federal investment, present and future, and bring about uniformity, Congress should immediately legislate to enforce the use, in rate making and otherwise, when proper accounting is needed in the management of federally owned power operations, of definite methods to determine original costs, and the amortization thereof, and the other charges such as depreciation which are to be covered by the rates determined on."

The committee also proposed methods of elimination of the duplication which obviously exists among the many agencies dealing with both federal and private electric power operations. The Buchanan committee recommended the continuation of its work.



Nation-wide News Service

ELECTRICAL LEADERS DISCUSS NEW YORK'S FAIR—Meeting with Grover Whalen, president, to map out sale of the World's Fair 4 per cent debentures

Seated left to right: F. C. Jones, president Okonite Company; Frank Ketcham, president Graybar Electric Company; Floyd L. Carlisle, chairman Consolidated Edison Company and Niagara Hudson Power Corporation; Mr. Whalen; Col. John P. Hogan, chief engineer and director of construction of the Fair; Theodore K. Quinn, president Maxon, Inc.; D. Youngholm, vice-president Westinghouse Electric & Manufacturing Company; Walter Robbins, chairman of General Cable Corporation. Standing left to right: Wylie Brown, president Phelps Dodge Copper Products Corporation; Howard A. Flanigan, administrative assistant to Mr. Whalen; Judge Charles W. Appleton, vice-president General Electric Company; H. D. Keresey, president Anaconda Wire & Cable Company; W. J. Donald, managing director National Electrical Manufacturers Association.

Associated Gas Reorganization Proceedings Dismissed by Court

Judge Mack acts on litigation which has been in progress for two years and seven months and cost the utility upward of $2,000,000 — System prepared to simplify structure and eliminate intermediate holding units

Reorganization proceedings against the $700,000,000 Associated Gas & Electric Company, which have dragged through the federal courts for two years and seven months, were brought to a close this week when Federal Judge Julian W. Mack granted the petition for dismissal both in the southern and northern districts of New York. Termination of the proceedings, brought by Jack Louis Kraus, 2d, counsel for a small group of creditors, was based on a recent report of accountants that indicated an improved condition of the company and was in accordance with a stipulation entered into on October 26, 1936, that gave the petitioning creditors three representatives in the management of the utility.

In dismissing the proceedings to reorganize the company under section 77–B of the Bankruptcy Act, Judge Mack made it clear that he was neither approving nor disapproving the stipulation. He also stated that it was a private agreement between the parties which he did not consider the court had the right to pass upon. At the same time Judge Mack made it clear that he was not authorizing anything that would be in violation of the Public Utility Act.

Eliminate holding units

Charles M. Travis, counsel for the utility, told the court that "this stipulation is not something hurriedly prepared or inadequately considered." He said that "I have no hesitation in assuring the court and the security holders of this system of the sincerity of the debtor in committing itself to the program of simplification contained in this stipulation." The simplification calls for the elemination of some of the intervening holding companies of the system. Mr. Travis said that steps have been taken to secure the necessary consents of governmental commissions to the consolidation of adjoining operating properties in various states and some of these consents have recently been obtained.

Whatever be the fate of section II of the Public Utility Holding Company Act, the so-called "death sentence," in the test of its constitutionality, Mr. Travis told the court that it is the sincere purpose of the Associated Gas & Electric Company to use every effort to accomplish its purpose voluntarily through simplification of structure and integration of physical properties."

Discussing the motion for dismissal of the proceedings, Judge Mack stated that "I am entirely willing to say now, however, that I haven't had an occasion to change the view I expressed at the conclusion of the first phase of this case on the 'good faith' issue.

Company solvent

"I appreciate the great change which has come over the public utility situation, not only as to the company, but others as well, since these proceedings were instituted. I appreciate that it may well be that if this company were proved to be insolvent when these proceedings were instituted, it may not be insolvent at this time."

When the reorganization proceedings were first instituted the utility was termed hopelessly insolvent. The good faith of the petitioners was bitterly attacked by the company, but upheld. The jurisdiction of Judge Mack was also questioned, affidavit of prejudice was filed against him, and these matters were appealed when the decision was against the company. Numerous appeals from minor decisions also delayed the attempts by Mr. Kraus to bring the question of solvency or insolvency to trial. The litigation has cost upward of $2,000,000, the company estimates.

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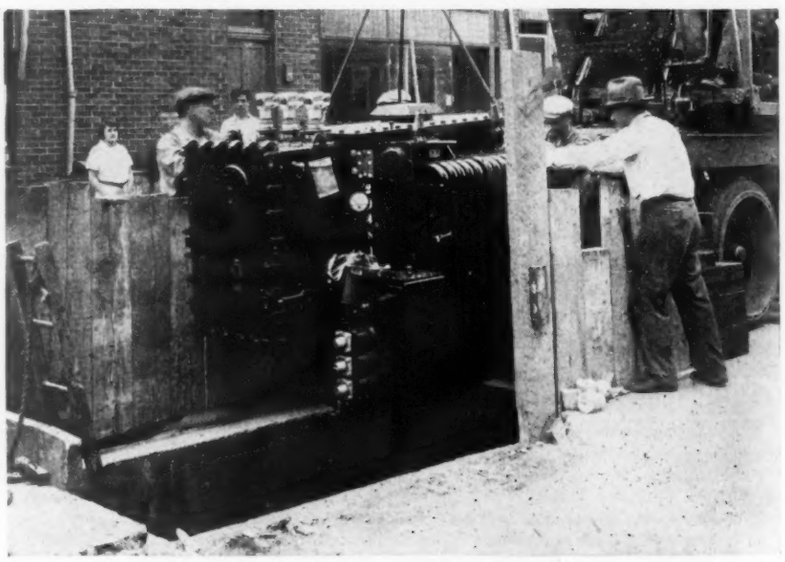
Fail of Agreement on Danville Project

Danville's $3,000,000 hydro-electric project in Patrick County, Virginia, again is being delayed pending a more definite agreement by the city, the National Park Service and the P.W.A. on plans which will reduce to a minimum damage to natural beauty. Delays are irritating members of the City Council, with consulting engineers admitting that the project is five months behind schedule.

The present delay is brought about by the necessity of rejecting all of the bids on the wooden pipe line, which is to convey water from the lower dam through a tunnel cut through the mountainside and dropping down by flumes to the power house. Changes in the pipe line made



CONCENTRATED PROTECTOR—This Westinghouse network protector, which is being installed in several places, has been greatly reduced in size for better arrangement of parts and by the use of Deïon air chambers

at the instance of the Park Service to hide the wooden pipe line ran the costs up beyond expectations and according to E. C. Brantly, superintendent of utilities, absorb most of the extra grant money.

Fifteen months have seen preliminary work carried out at The Pinnacles at a cost of more than $500,000, but no acutal construction work has been started except the building of a 300-man camp to house the workers on the project and the completion of three surfaced access roads.

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State Legislatures Consider New Bills

New legislation affecting electric light and power companies in various sections of the country have been introduced in the state legislatures:

MINNESOTA—The public ownership program advocated by the Farmer-Labor party in its platform and by Gov. Elmer A. Benson in his message to the Legislature made its appearance in the House last week in two proposed laws. One was the familiar proposal to put the state in the electric power business through a constitutional amendment authorizing issuance of $50,000,000 bonds to give it complete control over water power. The other measure would throw all public utilities on the market for acquisition by the municipalities in which they operate. It would empower any municipality in the state to exercise its right of eminent domain to condemn and take for public ownership any privately owned utility.

NEW YORK—Under the provisions of a bill introduced in the Senate and referred to the public service committee paragraph 110, Public Service Law, is amended by providing no management, construction, engineering, auditing, accounting or appraisal contract or contract for purchase or sale of securities, material or supplies made by public utility with an affiliated interest or with any corporation with which an officer or director of the utility is an officer or director shall be effected unless first having been filed and approved by the commission. A second bill, like the first introduced by Senator Burchill, and also referred to the public service committee, adds new subdivision 7, section 65, Public Service Law, requiring gas and electric corporations whose shedules contain optional rates to give written notice within 30 days after September 1, 1937, and annually thereafter to each consumer and making lowest rate or form of rate available for future service.

VIRGINIA—Opponents of the new measure enacted by the special session of the General Assembly, authorizing the State Corporation Commission to allocate territory among utility companies or private companies and co-operatives when disputes arise, have taken steps to bring about its defeat by executive veto. A delegation from Arlington County at a hearing before Governor Peery maintained that the bill might interfere with local plans to obtain lower electric rates. R.E.A. had already asked the Governor to shelve the measure. Governor Peery reserved decision.

Utility Reforms Urged by Lehman in Annual Message to Legislature

Recommends commission be empowered to limit electric rates charged by municipalities to cost of service — Seeks rigid control of business relations between utility and its officials — Cites cut in rates

Recommendations that the Public Service Commission be empowered to limit rates charged by municipalities for rendering service to actual cost, regulation of "submetering" traffic, more rigid control of business relations and transactions between a public utility and its officers and directors and elimination of surcharge on telephone handsets were made by Gov. Herbert H. Lehman in his message to the New York State Legislature.

Governor Lehman pointed out that in the past three years utilities in the state have cut rates to effect an annual saving of $32,000,000 to customers. This month rate reductions and refunds will total $7,000,000, he said.

Limit rates to cost

Discussing rates charged by municipally owned utilities, Governor Lehman expressed the belief that the Public Service Commission should have full authority to limit such rates to actual cost of rendering service. Such costs to contain all "proper elements of charge so that the taxpayers will not be called upon to make good any deficiencies in capital or in operating expenses." He added that it "is fair to include an amount estimated to be equal to the taxes which would have been paid to the municipality by a private plant. "The commission should be given the power to act promptly to reduce rates wherever municipalities attempt to burden consumers with rates in excess of cost of service."

It was also recommended that clarifying legislation be enacted at this session to give the commission authority to prescribe depreciation accounting. In regard to submetering companies, Governor Lehman recommended that they be brought under jurisdiction of the commission.

Rural lines built

"I renew the recommendation, rejected last session by the Assembly," Governor Lehman said, "for the more strict control of business relations and transactions between a public utility and its officers and directors who may deal with it in a personal capacity or through corporations in which they are interested. The abuses of cost plus construction contracts and similar practices are too well known. Their immediate eradication is necessary."

It was pointed out by the Governor that "very substantial progress has recently been made in the construction of electric lines to serve rural populations." He said that the Public Service Commission has approved construction programs calling for the erection of 6,000 miles of additional lines. During the past year, he said, about 3,200 miles of new lines have made electric service available to more than 15,000 new customers. In addition, more than 5,000 customers have been added to lines previously existing.

The State Conference of Mayors went on record as opposed to any restriction on the use of profits out of electric plants. It was declared that municipalities which operate electric light and power plants or distribute electricity should have the right to use the profits from such plants or distribution systems for general municipal purposes whenever they elect to do so.

It was also proposed that legislation be enacted giving cities the right to tax gross income of utilities.

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Maltbie Seeks Restoration of Legal Staff Salaries

Milo R. Maltbie, chairman of the New York Public Service Commission, is reported to be preparing to lead a fight before the Legislature to restore salary schedules of the legal staff to prevent crippling of the staff through resignations. It was pointed out that the commission has lost several members of its legal staff because of the item of salaries. So far Col. Charles G. Blakeslee, for years chief counsel to the commission; John J. Donahue and John T. Ryan have resigned, and it is reported that some of the other members of the legal staff may resign because of low salaries.

New Deal to Press Attact On Utilities

No diminution of the Administration's warfare against the Power Industry can be expected from the adoption of the proposed plan for reorganizing the executive branch of the Federal establishment. On the contrary, it seems logical to expect that the President's policies will, if anything, be put into effect with greater celerity through the liaison work of the six executive assistants who will be at his call by the plan.

The popular assumption that reorganization implies a reduction in the scope of Federal activities is true only of the proposal advanced by Senator Byrd; that sponsored by the White House contemplates decrease in the essential functions of the government and is aimed principally at greater effectiveness in administration. Such minor economies may result in a cut in overhead of only $10,000,000.

Federal agencies, directly involved, in the power picture include the Federal Power Commission, Rural Electrification Administration, Securities & Exchange Commission, Electric Home & Farm Authority, Tennessee Valley Authority, Bureau of Reclamation, Corps of Engineers and the Power Division of P.W.A. The latter is an "emergency" agency created as part of the relief organization. Reclamation, now in the Interior Department, will probably be assigned to the new Department of Public Works or the Department of Conservation.

•

Seek Accounting In Doherty Suit

Trial of a suit based on alleged illegal control and misuse of stockholders' money against Henry L. Doherty and his interests began this week in New York before Federal Judge John W. Clancy. The basic demands are for an accounting of $80,000,000 allegedly lost between 1927 and 1930 and return of $20,500,000 received by Mr. Doherty in a stock deal with the Cities Service Securities Corporation.

The action is brought by a minority group, with Mr. Doherty, Cities Service Company, Cities Service Securities Corporation, the H. L. Doherty & Company, Inc., and officers and directors of Cities Service named as defendants.

Percival E. Jackson, counsel for the plaintiffs, alleged that Mr. Doherty and ten officers and directors of Cities Service were guilty of "misfeasance and malfeasance" in their duties. Joseph M. Proskauer, formerly supreme court justice, who is associated with John W. Davis as counsel for the Cities Service Interests, questioned the motives of the plaintiffs, asserting "the very character of the attack is based on no decent and no proper motive to assert for this corporation a cause of action against Mr. Doherty, for whom I speak."

A defense motion to dismiss on the ground that the original complainant, Harry J. Trimbur, had withdrawn was taken under advisement.

•

Wisconsin Utility Budget Includes Generating Plant

Approval of the Wisconsin Public Service Corporation's 1937 construction budget totaling $1,570,560 has been announced by J. P. Pulliam, president of the company. Included in the 1937 budget is an appropriation of approximately $480,000 for erection of a new dam generating plant and substation at the site of the old Tomahawk Pulp & Paper Company in Tomahawk, Wis. Construction of this new station will add approximately 2,500 kw.-hr. to the company's system. Total number of customers served in 1936 increased 4.6 per cent over the previous year.

•

S.E.C. Policy to Make Utility Act Workable

The Securities and Exchange Commission in its annual report stated that in administering the public utility act its general policy would be to give full effect to the intent of Congress of "preventing the repetition of abuses which led to the passage of the acts," and at the same time to make the legislation as "workable as possible without imposing restrictions of a kind which bear no relationships to the purposes to be achieved."

The commission added that the rules and regulations for the utility industry would be made a matter of continuing study so that they may be made effective and "practical of application without unduly burdening the industry and without creating an unwarranted difficulty and expense of administration."

Budget Message Requests Nuisance Taxes Extension

Continuation of nineteen so-called nuisance taxes scheduled to expire in June and July was asked by President Roosevelt in his budget message to Congress. These taxes were estimated to yield $452,580,000 in revenue to the Treasury.

The list of taxes asked to be extended and the amounts estimated they will yield included electric energy, $34,060,000; radios, phonographs, etc., $7,570,000; mechanical refrigerators, $9,950,000, and telephone, telegraph, radio and cable facilities, $24,150,000.

•

Northern States Extensions

Plans for expending $179,700 or more in 1937 by the Northern States Power Company to improve and extend its facilities in the La Crosse, Wis., area have been announced by John G. Felton, district manager. The 1937 program is part of an $8,142,000 construction and improvement budget planned by the company throughout Minnesota, Wisconsin, North Dakota and South Dakota.

Meetings

Canadian Electrical Association — Midwinter conference, Mount Royal Hotel, Montreal, Que., January 18-19. B. C. Fairchild, secretary, 409 Power Building, Montreal.

American Institute of Electrical Engineers—Winter convention, New York, N. Y., January 25-29. H. H. Henline, national secretary, 33 West 39th Street, New York, N. Y.

Electric Metering Conference—Deshler Wallick Hotel, Columbus, Ohio, February 9-10. J. N. Schwartz, Columbus Railway, Power & Light Company, Columbus, Ohio.

National Electrical Manufacturers Association—Midwinter meeting, Waldorf-Astoria Hotel, New York, February 14-18. W. J. Donald, managing director, 155 East 44th Street, New York.

American Institute of Mining and Metallurgical Engineers — Annual meeting, New York, N. Y., February 15-18. A. H. Parsons, secretary, 29 West 39th St., New York, N. Y.

National Fire Protection Association—Electrical Committee, Atlantic City, N. J., March 9-12. A. R. Small, chairman, 207 East Ohio St., Chicago, Ill.

National Oil Burner and Air Conditioning Exposition—Philadelphia, Pa., March 15-19. C. F. Curtin, exposition manager, Oil Burner Institute, 30 Rockefeller Plaza, New York, N. Y.

Output Rebounds After Holidays

During the first full week of the new year the output of energy by the electric light and power industry rebounded from the sag due to the two holiday weeks to a point only slightly lower than the recent December peak. The amount as reported by the Edison Electric Institute was 2,244,030,000 kw.-hr. for the week ended January 9. Compared with the first full week of 1936, ended January 11, there was an increase of 13.9 per cent, which is close to the average rate of gain over the preceding year during the four weeks before Christmas.

To adjust for calendar conditions and to prevent the weekly statements from drifting away from corresponding statements for earlier years the week of January 2 is considered by the Institute to have no comparable week in 1936. The week of January 9, 1937, is thereby brought into comparison with that of January 4, 1936, which included a holiday. Regional changes computed on this basis would be misleading and are omitted.

Weekly Output, Millions of Kw.-Hr.

1937		1936		1935	
Jan. 9	2,244	Jan. 11	1,971	Jan. 12	1,773
Jan. 2	2,069	Jan. 4	1,855	Jan. 5	1,669
1936		**1935**		**1934**	
Dec. 26	2,081	Dec. 28	1,847	Dec. 29	1,650
Dec. 19	2,275	Dec. 21	2,002	Dec. 22	1,788
Dec. 12	2,278	Dec. 14	1,983	Dec. 15	1,767
Dec. 5	2,244	Dec. 7	1,970	Dec. 8	1,743

Chattanooga May Cancel T.V.A. Power

Col. Harold Fiske, chairman of the Chattanooga Electric Power Board, has written Dr. Arthur E. Morgan, chairman of the Tennessee Valley Authority, threatening that the city will cancel its plans to utilize T.V.A. power unless action is taken to speed up the service.

In March, 1935, Chattanooga voted an issue of $8,000,000 of bonds to acquire an electric distribution system for the city. Efforts to purchase the local facilities failed because of the low price offered.

Further action on the part of the T.V.A. is prevented, however, by the present truce, expiring February 3, between T.V.A. and Commonwealth & Southern Corporation subsidiaries, and also by the restraining order against further expansion of T.V.A. power activities recently issued by Federal Judge John J. Gore.

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Farm Power Meeting to Be Held in Atlanta

The second in a series of regional farm power conferences under the auspices of the General Electric Company will be held in Atlanta, Ga., January 20 and 21. These conferences, the first of which was held in Schenectady last month, and designed to equip those who contact farm families to furnish information and helpful suggestions on all phase of practical uses for electricity on the farm and in the farmhouse.

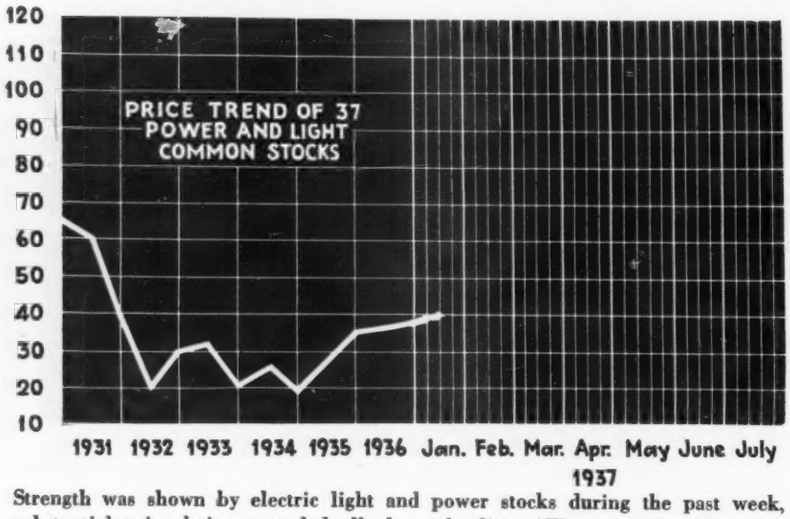
The Atlanta meeting will be attended by representatives from organizations in Virginia, Tennessee, North Carolina, South Carolina, Georgia, Mississippi, Alabama and Florida. The discussions will be directed by leading authorities on rural electrification. General subjects of interest to all farmers will be discussed.

•

Correction

In the January 9 issue of ELECTRICAL WORLD credit was given to General Electric Company for the picture on "Electric-Welded Dome and Barrel." The credit should have been to the Lincoln Electric Company.

Utility Stocks Move Upward



Strength was shown by electric light and power stocks during the past week, substantial gains being recorded all along the list. "Electrical World" index, 41.5; last week, 39.1

Commission Extends System of Accounts

The Federal Power Commission has announced an amendment to its uniform system of accounts for public utilities and licensees subject to the Federal Power Act, making the system applicable to the smaller concerns. The uniform system of accounts for the larger companies went into effect on January 1. The appendix now added, applicable to Class C and D public utilities and licensees, will not be effective until January 1, 1938. The system of accounts previously adopted by the Federal Power Commission applied in detail to only Class A and Class B public utilities and licensees.

•

Utilities Power Suit Intervention Granted

Federal Judge William H. Holly granted the petition of Harley L. Clarke, former president of Utilities Power & Light Corporation, and the Atlas Corporation to intervene in the reorganization proceedings of the utility. At the same time Judge Holly denied the petition of Associated Investing Company, an affiliate of Associated Gas & Electric Company, to intervene.

The petition of Atlas sets forth that it owns approximately $21,000,000 of bonds, notes and other obligations of Utilities Power & Light. Associated Investing sets forth that it owns $27,000,000 of the debentures and 28 per cent of the class B stock.

Attorneys for Mr. Clarke have filed a $100,000 slander suit against Dwight H. Green, attorney for the company, in connection with statements Mr. Green made at a recent reorganization hearing. According to the declaration Mr. Green is alleged to have declared on January 3 in the court of Federal Judge William H. Holly that Mr. Clarke "is a self-confessed embezzler of funds of this corporation."

•

Starts Racket Drive On Electrical Jobs

Thomas E. Dewey, special prosecutor of rackets for Nek York City, has launched a drive against racketeering in the electrical contracting industry, in which a toll of $10,000,000 a year is said to have been extorted from the public by a monopoly built up by ruthless strong-arm tactics.

Representatives of Mr. Dewey have subpoenaed the books of Local 3 of the International Brotherhood of Electrical Workers, long the target of charges of racketeering and union politics; of the New York Electrical Contractors Association, Inc., the voluntary local code of fair competition of New York City; the Electrical Industry of New York City, Inc., and of many individual contractors.

The records of the New York and Brooklyn Edison Companies and other subsidiaries of the Consolidated Edison System will be examined according to Thurston Greene, one of Mr. Dewey's Assistants. Frank W. Smith, president of Consolidated Edison Company, has been served with a subpoena through his attorney.

Work on the investigation has been carried on since December, 1935, and Mr. Greene estimates that the monopoly built up by the racketeers had exacted a levy of about 20 per cent on the electrical contracting industry in New York City, which he estimated did a gross business of about $50,000,000 a year. It is also charged that many independent contractors have been forced out of business.

•

Utilities File New S.E.C. Applications

Announcements covering registrations, exemptions, etc., have been recently released by S.E.C. as follows:

Iowa Public Service Company has filed a declaration and amendments thereto, pursuant to section 7 of the Public Utility Holding Company Act of 1935, regarding the issue and exchange by it of 412,000 shares of its common capital stock, par value $15 per share, for its outstanding 412,000 shares of no par value common capital stock, carried on its books at a stated value of $15 per share.

Republic Service Management Company has been authorized to organize and conduct business as a sudsidiary service company of Republic Service Corporation. The management company will be incorporated under the laws of the State of Delaware for the performance of service and sales contracts for all the associate companies of Republic Service Corporation, consisting of eleven electric utility subsidiaries, five nonutility subsidiaries, and also for Republic Service Corporation.

S.E.C. has called a hearing for January 25 on an application under the Public Utility Holding Company Act for issuance by the North American Gas & Electric Company of Summit, N. J., of $2,248,819 of 6 per cent cumulative income debentures to fund unsecured indebtedness pursuant to an amended reorganization plan.

Missouri Gas & Electric Service Company, which is to become a subsidiary of the Middle West Corporation, has filed application for exemption under the Public Utility Holding Company Act from the requirements for filing a declaration under section 7 with respect to an issue of first mortgage bonds, totaling $1,476,630 and 25,375 shares of no-par value common stock. The Middle West Corporation also filed an application for approval of the acquisition of 12,687.5 shares of the common stock of Missouri Gas & Electric Service Company (as reorganized) in accordance with the reorganization plan of Missouri Gas & Electric Service Company, predecessor company.

New England Gas & Electric Association has applied for exemption as a registered holding company.

American Utilities Service Corporation of Savanna, Ill., a holding company with subsidiaries operating in eighteen states, which has been contesting the validity of the Public Utility Holding Company Act, has registered under the Act, S.E.C. announced.

Manufacturing AND MARKETS

Pacific Electric Now Is California Owned

The Pacific Electric Manufacturing Corporation is now entirely California owned and operated as a result of the purchase on November 9, 1936, by Joseph S. Thompson, president, of all interest and stock of the corporation owned by General Electric Company. Eight years ago General Electric secured a virtual half interest in the company. With the sale of this stock James A. Cranston has retired from the board of directors.

The officers of the company remain the same, Mr. Thompson, president; Frederick Thompson, vice-president; James A. Thompson, executive vice-president; Edward F. Sixtus, vice-president in charge of sales; George T. Challoner, secretary and treasurer, and A. C. Schwager, chief engineer.

The corporation operates a factory in San Francisco and a small branch maintenance and storage plant in Gary, Ind. It was first incorporated in 1906.

•

Largest Unfilled Orders Reported in Seven Years

Worthington Pump & Machinery Corporation, Harrison, N. J., reports that it has entered the new year with the largest backlog of unfilled orders since 1930.

•

Maytag Sales Unit Formed

Maytag Sales Company, Inc., Roanoke, Va., with maximum capital of $15,000, has been chartered by the State Corporation Commission to buy, sell and deal in washing machines. Clement D. Johnston of Roanoke is president.

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Last Quarter Orders Advance 45 Per Cent

Orders received by the General Electric Company during the year 1936 amounted to $296,748,219, compared with $217,361,587 during 1935, an increase of 37 per cent, President Gerard Swope announced this week.

Orders for the quarter ended December 31 amounted to $84,857,181, compared with $58,417,822 for the last quarter of 1935, an increase of 45 per cent. Sales billed and earnings for the year 1936 are not yet available. The company's annual report will be issued in the latter part of March.

•

Trade Commission Cites Retail Furniture Dealers

The Federal Trade Commission has ordered the Retail Furniture Dealers Association of St. Louis, its officers and 36 merchant members, all of St. Louis and East St. Louis, Ill., to cease and desist from certain unfair trade practices in the interstate sale of furniture and allied products, including electric refrigerators and radios.

These practices, the commission said, are held to have tended toward the creation of a monopoly.

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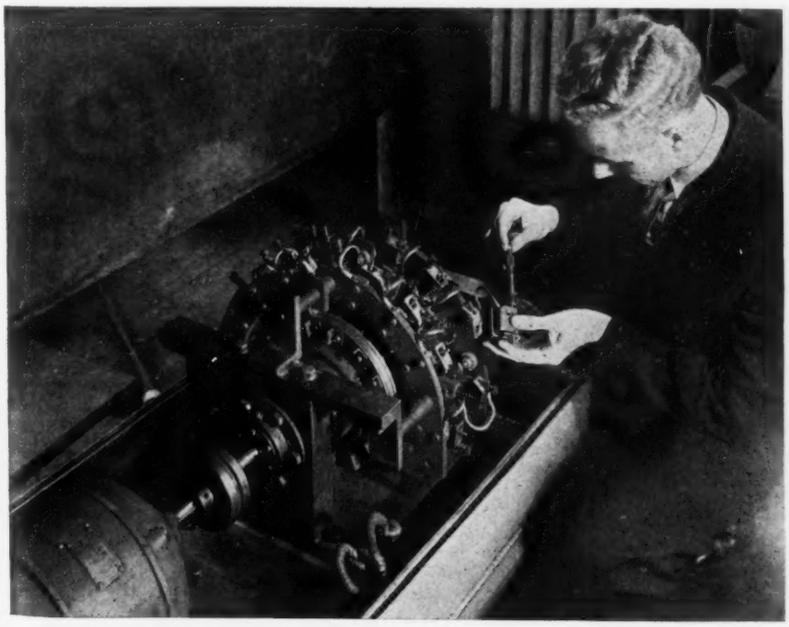
G.E. Plans Dallas Addition

A three-story concrete and brick addition to the General Electric building at Dallas, Tex., will be constructed immediately. The new structure will adjoin the office and warehouse building now located at the corner of Lamar and Corbin Streets and will provide all departments of the company with permanent headquarters in Dallas.



STUDYING BRUSH WEAR—Tests by Westinghouse engineers have shown that some carbon brushes with an equivalent life of two years in air may last 100 years in hydrogen. Many grades of metal-graphite brushes have ten times their normal life when operated in hydrogen or other inert gases

Power Project Bills Flood New Congress

Eager to receive early recognition, members of the 75th Congress flooded the hopper with all sorts of proposals—good, bad and indifferent—most of which will never receive any serious consideration, but a few of which will make subsequent headlines. Among the hundreds of bills introduced the following pertained to power projects:

H.J. Res. 11—Changing the name of Pickwick Landing Dam, now under construction, to Rankin Dam.

H. R. 92—Placing the operation of Bonneville Dam and appurtenant works, when completed, under the Corps of Engineers, with rate regulation by the Federal Power Commission. The same bill as failed last session.

H. R. 117—Establishing a Columbia Valley Authority, modeled after T.V.A., and turning over to it works at Bonneville and Grand Coulee.

H. R. 114—Authorizing study of the Cabinet Gorge power and reclamation project on the Clark Fork of the Columbia River near the Montana-Idaho boundary.

H. R. 192—Establishing a Missouri Valley Authority along T.V.A. lines.

H. R. 275—Establishing a Wisconsin Valley Authority.

S 255—Adding the Cumberland River basin to the jurisdiction of T.V.A.

•

Power Plants Hearing Set

The government moved closer last week to an early decision by the Supreme Court on the question of Federal loans to municipalities trying to set up their own power systems in competition with private utilities. The District of Columbia Court of Appeals decided to hear arguments February 9 in the suits of the Alabama Power Company and the Iowa City Light & Power Company.

•

Century Electric Bonuses

Bonuses aggregating $60,000 have been distributed to the 1,200 officials, department heads and employees of the electrical division of the Century Electric Company. The payments were limited to those employed by the company for two years or more.

New York Metal Prices

	Jan. 6, 1937 Cents per Pound	Jan. 13, 1937 Cents per Pound
Copper electrolytic	12.00*	12.50*
Lead Am. S. & R. price	6.00	6.00
Antimony	14.00	14.00
Nickel ingot	35.00	35.00
Zinc spot	5.80	6.35
Tin Straits	51.00	51.10
Aluminum, 99 per cent	19—20	19—20

* Delivered Connecticut Valley.

Field Reports on Business

Reports from the field to ELECTRICAL WORLD *indicate that orders for industrial electrical equipment are running ahead of last year, with motors in good demand. Complete returns on the holiday trade show that merchandising set new heights for recent years. Retail business for the first week of 1937 ranged from 10 to 15 per cent above the similar month of 1936, while in the wholesale division gains were from 18 to 22 per cent.*

NEW ENGLAND

There remains in the plans for power generation expansion in this district approximately 100,000 kw. in turbo-generator installations and, in addition, several small power unit projects in connection with enlarging industrial plants. These are engaging the attention of engineers at present. Motors continue to show a steady trend; paper, rayon and textile plants are busy in this area and their requirements include considerable electrical equipment. Inquiries for small switch and control continue in good volume.

Commercial electric cooking is very active in this district. In Boston new restaurant installations of 160 kw. and 60 kw. were contracted for last month; a new elaborate roadside restaurant has purchased electric appliances involving 40 kw. in energy. Rural electrification is progressing favorably in this area. One manufacturer recently sold 260 electric brooders in New England.

Merchandising during the holidays set new heights in sales as compared with the volume reported during the past five years. The New England Power Association gained over 9 per cent in energy sales to residential and farm customers up to December 1 of 1936 and 17 per cent in industrial power consumption. Appliance sales on this system gained 18 per cent over last year.

Within the Boston area merchandising gained over last year; portable electric lamps received much attention and provided a good volume of sales; electric refrigerators and ranges were in strong demand. During the past year the Boston Edison system added 37,000 electric refrigerators to the lines; this same system reports the sales of 2,000 electric ranges, which brought the total number of customers using these units to 12,500.

With every indication that residential building will continue strong in 1937 and announcements at hand of industrial advances in new business contracted, the electrical market presents an encouraging view here. The Boston & Maine Railroad will spend $1,820,000 on new equipment which will involve air-conditioning units for 55 new de luxe passenger coaches and new lighting systems and air conditioning for 30 present all-steel coaches.

CHICAGO

Despite widespread labor unrest the tide of business activity climbed to new post-depression peaks measured by a seasonally adjusted index. Heavy goods industries provided a large part of the stimulus. Several local industries were forced to curtail operations as a result of automobile strikes, but, on the whole, labor disturbances have not as yet left any serious imprints on the industrial picture. It is significant that the demand for products is increasing in virtually every field. The backlog of steel orders assures a satisfactory rate of operations for some weeks. Building construction in this area gives every indication of running considerably above that of last year.

Chicago continued to lead all other cities in both the number and size of air-conditioning installations last year. Commonwealth Edison Company reports 433 new installations with a capacity of 8,793 hp. were made during 1936. This represents an increase of 37 per cent in the number of jobs and 55 per cent in capacity over 1935.

Orders for industrial electrical equipment are running ahead of last year. Sales of motors and control apparatus are especially good. Transformers are in demand. Government-financed work is materially benefiting electrical contractors. One job for 225 miles of transmission lines was awarded for $245,000. The electrical contract on the new outer drive bridge and approaches amounted to $279,000. Electrical work on the river control locks will cost $58,400. Another P.W.A. project involves $80,000 for electrical equipment on a new bridge.

NEW YORK

Business of electrical equipment manufacturers has turned upward rather sharply in recent weeks, it is reported. Producers of both heavy electrical equipment and household lines report increased activity. Leading manufacturers have increased copper wire prices ½ cent for bare wire, ⅛ cent per pound for magnet wire and ⅜ cent per pound for weatherproofing. The price of domestic copper has been advanced ½ cent a pound to 12½ cents. Abroad it sold at 12.725 c.i.f. European base ports.

One utility company will soon be in the market for generators and transformers and rural line equipment.

PACIFIC COAST

The coast is optimistic over 1937 prospects because natural factors are good and the momentum of construction and electrical merchandising business is such that the marine strike has merely diverted it to rail adjustments in price and delivery instead of damming it up. Machinery manufacturers predict an excellent year, particularly of motors and transformers up to 20 kva. to cover special power rate applications in plants, with several recent sales of 50 or 75 lots and much generating equipment to handle pumping and irrigation load increase caused by light snow pack, which is now averaging 4 ft. in place of the usual 10 ft.

Power companies report exceedingly successful major appliance campaigns and also complete closeout of floor and warehouse stocks in ranges. Unusually cold weather has cleaned out all stocks of auxiliary heaters and swamped coast factories with reorders. The low level broadway tunnel in East Bay district includes a $200,000 contract for electrical and mechanical installation. MGM is making a million-dollar addition to its Culver City film production plant, principally for new sound stages, necessitating large electrical purchases.

THURSDAY,
WANTED!
A BIG POWER SALESMAN
. . . An experienced public utility man with the vision to project a civic improvement that is also a highly profitable load builder. This man must be a self-starter, in a move that is economically sound and a proved success. He must have the open mindedness to marshal the facts, and then make the logical moves to apply them in his territory. The job is to energize one sale amounting to hundreds of thousands of kilowatt-hours a year for his company, and offering lasting advantages to the community.
Operation
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WHICH MAN in YOUR Company Can Qualify?

NO big idea ever went over by reason of its own bigness. At the start some single individual had to get behind it—and push.

Such a man must be self-appointed. The above "want ad" is intended to hasten the time when that man in your company will see the big idea—the big load—in the trolley coach.

The job is simple if viewed in proper perspective, for the element that retards widespread power-company participation in the trolley-coach load is neither franchises nor finances. Nor is it any "BUTS" summoned up to argue against a convincing record of trolley-coach successes in a long list of cities. We believe that the REAL retarding element has been, essentially, attitudes of mind—which can easily be changed.

The man wanted by your company—to clarify those mental attitudes—will start at once to take seriously your loss of street-railway power load. He will recognize in the trolley coach a desirable means of saving that load, and he will urge its adoption among transit operators in your territory. General Electric offers him co-operation. General Electric Company, Schenectady, N. Y.

GENERAL ELECTRIC

232-42

Field OPERATING PRACTICES

New ideas and practices in the operation of well-designed, constructed and maintained plants and systems

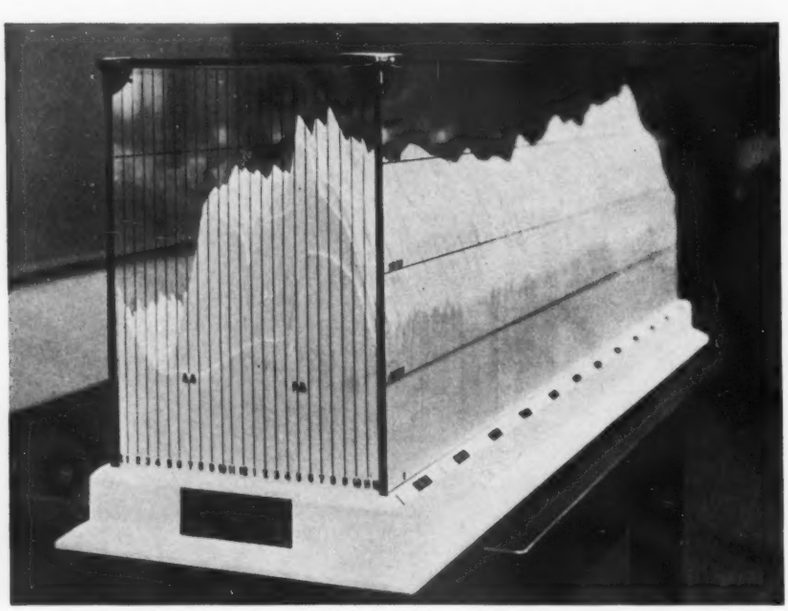
Load Curve in Relief Impressive Exhibit

By R. R. PRIMROSE
Commonwealth Edison Company, Chicago

Although three-dimensional curves of annual load are no novelty among electric utility statistical sharks, it is not often that one is dolled up and brought out into public notice as was done with the relief presentation of the 1935 load of the Commonwealth Edison Company for the World Power Conference. The size of the exhibit and the manner of its construction make it worthy of notice.

Three-ply bass wood was used in the construction of the display, in preference to cardboard, to prevent warping and fraying. The boards measure 1/8x17x11 in. and cost only slightly more than heavy cardboard of the same dimensions. The curves were drawn on the boards by using a paper pattern, which had been drawn to scale and from which 365 copies, one for each day in the year, were planographed the same size as the boards. The hourly load points were spotted on these sheets. By placing carbon paper between the pattern and board the points were then transferred to the surface of the boards. The points on the board were then connected, making a straight-line curve, and it was ready to be cut out. The boards were cut on a bandsaw and then filed, sand papered, lacquered, enameled and dated.

The glass case, weighing 60 lb., is ruled with a scale in kilowatts on the sides and with the 24-hour period from 12 midnight to 12 midnight on each end. The exhibit is about 5 ft. long and weighs approximately 300 lb. The case in which it is shipped has a removable top and a hinged side. When in this container the display rests on small rollers so that it can be rolled easily onto the drop side of the case.

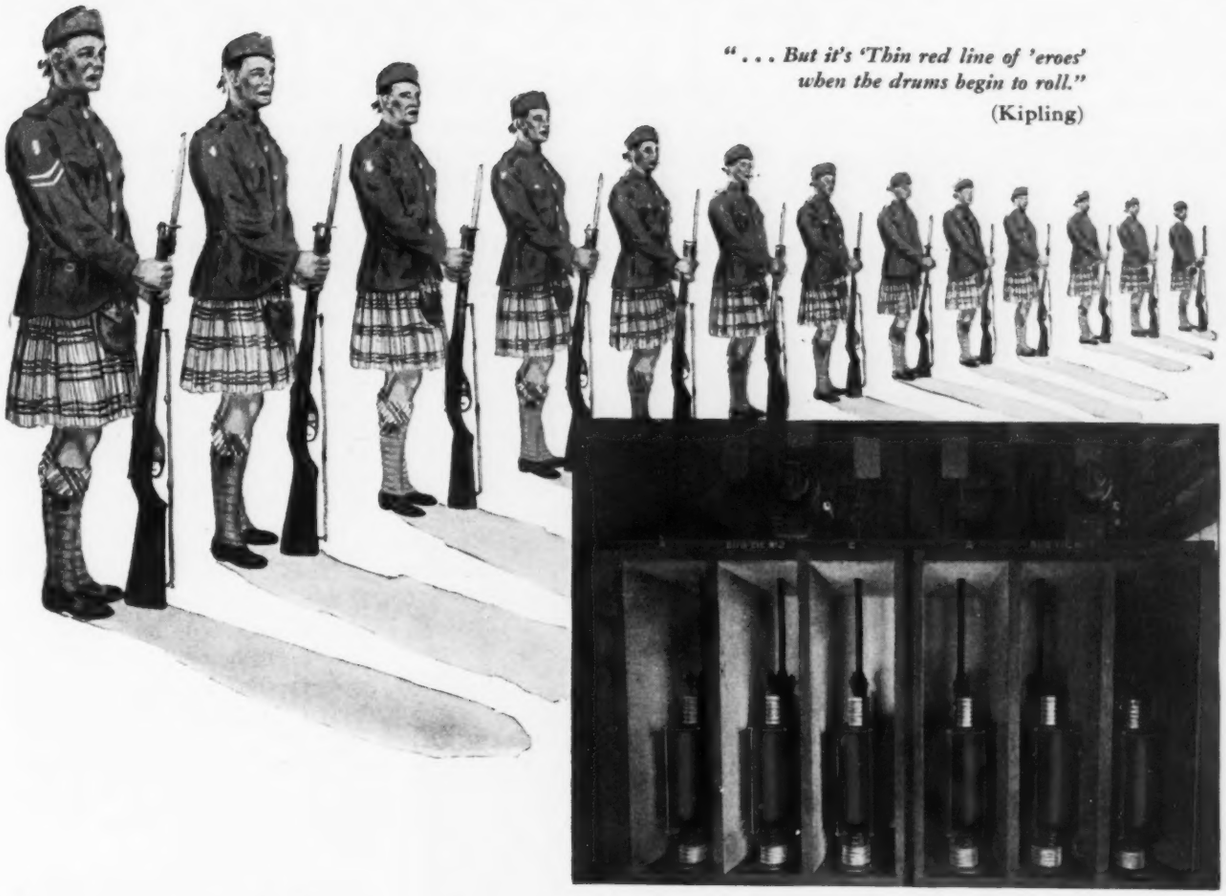


Iceberg contours tell story of annual load

Utility Enlarges Cadet Program

By JOHN COLLISTER
Production Engineer, The Ohio Public Service Company, Warren, Ohio

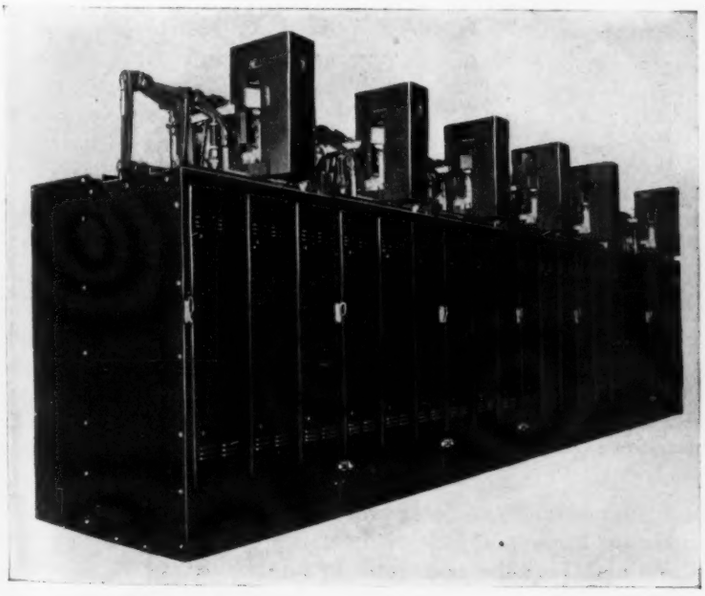
The policy of building better men for the production department at Mahoningside station of the Ohio Public Service Company in Warren, Ohio, combining in a cadet course practical experience and supervised study, was so satisfactory that when men were needed to enlarge the organization in 1934 it was decided to continue the program on a larger and more comprehensive scale. Accordingly, a plan was drafted which set forth in detail the conditions to be complied with, and a schedule of changes in the training course. As approved by the company's executives, and put into effect, the plant requires (1) a high school education, (2) a satisfactory report from the high school superintendent, (3) intelligence and ambition on the part of the individual and (4) good citizenship. Preferably the men come directly to the course from high school without having been employed elsewhere. They are started at a predetermined monthly rate, beyond which increases in pay have been scheduled for those whose work and study is



". . . But it's 'Thin red line of 'eroes'
when the drums begin to roll."
(Kipling)

History Makers for Protection and Economy

—*Modern FH BREAKERS March On in Steel*



OPERATING men recognize in the success of more than 30,000 FH breakers in front-line duty—many of them since 1898—the soundness of the basic FH principle and convincing proof of their dependability.

Today these breakers are housed in steel cubicles or trucks, with sturdy interlocks to assure the utmost in safety to personnel and equipment. Furthermore, you receive these units assembled—ready for immediate low-cost installation. General Electric Company, Schenectady, N. Y.

890-16

GENERAL ELECTRIC

above a minimum standard. These raises are made at six-month intervals, on the recommendation of the students' foremen and after satisfactory completion of that part of the scheduled training work. The last half of the final raise is conditioned upon the cadet having secured an operating engineer's license from the Department of Industrial Relations of the State of Ohio.

Each student who, after being at work in the plant for not less than 30 days, decides to continue the training must subscribe to a correspondence course in steam engineering or its equivalent. Upon the satisfactory completion of the correspondence course, one-half of its cost is refunded to the student by the company. This policy has resulted in the completion of a surprising number of these courses. Complete records are kept on each student, and in the event of his transfer his record goes with him.

Meetings are addressed at intervals by the foremen to give the students the benefit of these men's experience. The plant superintendent also attends these meetings to discuss with the group problems pertaining to the plant.

Practical training offered

The practical training of the cadets is divided approximately as follows and as nearly as practicable is handled in this order:

Labor gang, four months; filter plant, two months; boiler room oiling, four months; boiler room maintenance, four months; turbine room oiling, four months; turbine room maintenance, four months; results office, four months; meter work, four months; machine shop, four months; electrical maintenance, three months; switchboard operation, one month.

At the end of the 38 months' period the cadet is placed on his own responsibility. His further progress depends to a great extent on himself.

There is very good reason to believe that this course of training will develop some excellent men for the Ohio Public Service Company. The foremen in whose charge the students have been placed have with few exceptions been well pleased with the collective efforts of the group. In fact, considerable credit for the success of the training course is due the individual foremen, who have entered wholeheartedly into the work and have taken a great interest in giving the cadets the benefit of their own experience, the better to fit them to take important positions in the Mahoningside organization. Thus the company, through sponsoring this training course, is acquiring men who will be well trained and capable of handling any job in the plant in emergency.

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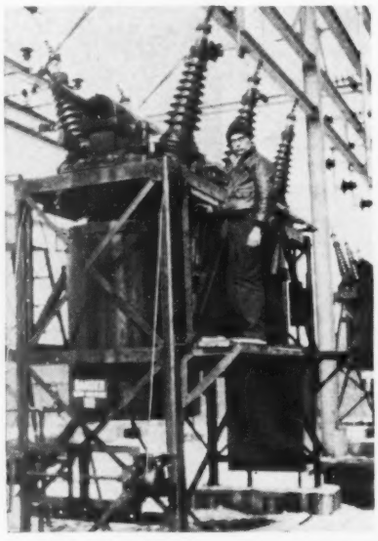
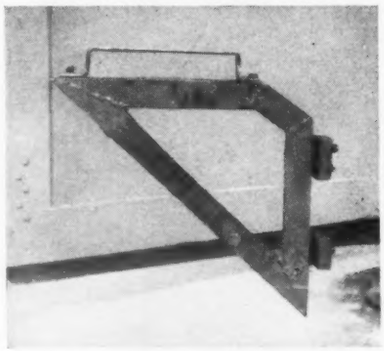
Breaker Job Time Saved by Scaffold

By R. H. MARUCHI
General Electric Company, Philadelphia

During installation, inspection or modernization of a frame-mounted breaker it is necessary to do considerable work while standing on a step-ladder. The difficulty of balance on such a support handicaps the service man. The accompanying illustrations





Scaffold support makes breaker maintenance easier

show a platform support that is helpful in eliminating the hazards of ladders as well as simplifying the task of reaching the upper parts of a breaker. The supports can be made from angle iron or flat iron, but the quickly detachable feature should be retained. A clamping strap at the top that bolts into place prevents the plank from getting out of position. The two clamps on the vertical member are welded in place.

When mounting the supports on a breaker it is necessary only to slip the clamp over the vertical frame angles and securely tighten the set-screws. The clamps can be left off if mounting holes are provided in the breaker frame, but variations in the height of the platform to suit the work being done will not be possible unless a series of holes are drilled in the frame.

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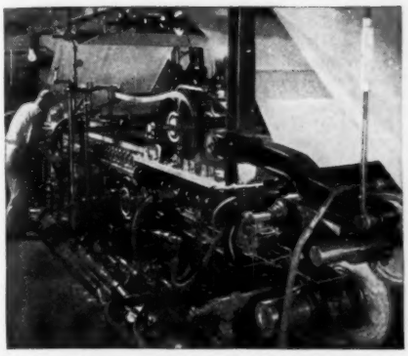
Insulating Helmets Used in France

How much danger does a lineman run of bringing his head in contact with a high-voltage line? A careful and experienced man will always have a subconscious mental picture of the relationship of all parts of his body to the live elements of the structural situation in which he is working, and this subconscious picture will intuitively provide a proper limitation upon all movement, even though outside the direct range of vision. However, there is no doubt that sudden and unforeseen occurrences causing momentary relaxation of attention may also cause involuntary movements to the sides and rear for which direct vision cannot offer its usual instinctive protection. A paper by M. Dagory in the April number of the *Bulletin de la Société Française des Electriciens* records an analysis of fatal accidents of over ten years on a 15,000-volt system, showing that out of eleven deaths by shock three were received on the top of the head, one on the chin, three through the hands, one through the feet and three uncertain.

Believing this type of danger constitutes a major hazard, the National Railways of France have developed an insulating helmet for use by linemen and electrical workers exposed to possible direct contact in other installations in which modern methods of automatic protection have not, for various reasons, been installed. The helmet is made principally of oiled silk in layers sufficient in number to more than equal in dielectric strength the voltage of the circuit in question. Since the thinnest oiled silk, 0.03 mm. in thickness, has a breakdown strength of the order of 5,000 volts, the weight of the helmet, even though further

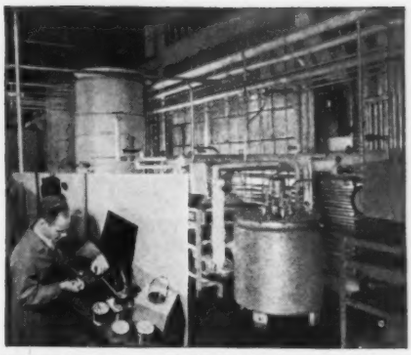
BUILDING RELIABILITY

into G-E Distribution Capacitors

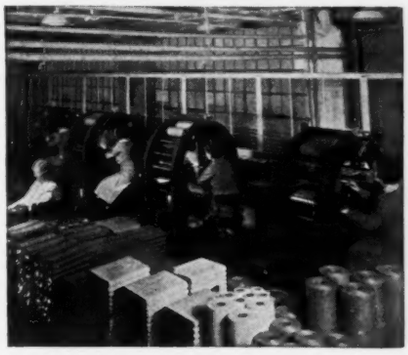


High-quality materials are the first requirement of a reliable capacitor. Thin Kraft paper is manufactured to our own rigid specifications on the most modern of paper-making machines

The foil is carefully tested for purity, cleanliness, and softness before it is accepted for G-E Pyranol capacitors



Pyranol — the noninflammable, nonexplosive liquid — is carefully refined and stored under vacuum. Characteristics are checked, just before use, for final assurance

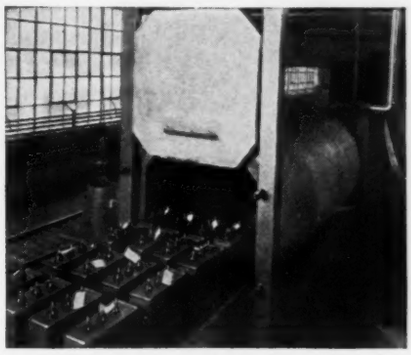


Careful manufacture is essential, and winding is the first step. Specially developed machines and experienced operators wind the foil and paper together

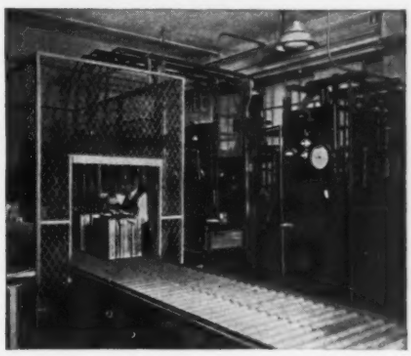
The completed rolls are placed in their containers and the cover is fastened. All seams are double rolled, assuring tightness and strength

Then the leads are pulled through and sealed to the bushings. The leads being taut, the possibility of internal short circuits and grounds is eliminated

Treating the assembly with Pyranol is painstakingly careful—it takes *a week*—and all operations are conducted under the most rigidly controlled conditions



Tests for quality are made after each step. This test checks the hermetically sealed units for leaks



And the final test is electrical—to make certain that the units measure up to operating requirements

PYRANOL capacitors are manufactured by an organization whose long experience has amply qualified it to build capacitors that meet the requirements of utility service. For proof of the reliability of these units, consider a service record that is 99.83 per cent perfect. General Electric, Schenectady, N. Y.

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increased by an outer layer of tough rubber, is inconsiderable.

Statement is made that the linemen of the National Railways are quite satisfied to use the helmet and do so without inconvenience when working in the neighborhood of live circuits. It is also reported that the helmet has been adopted in the arsenals of the French Navy and that they are also included in the equipment of the new liner *Normandie*.

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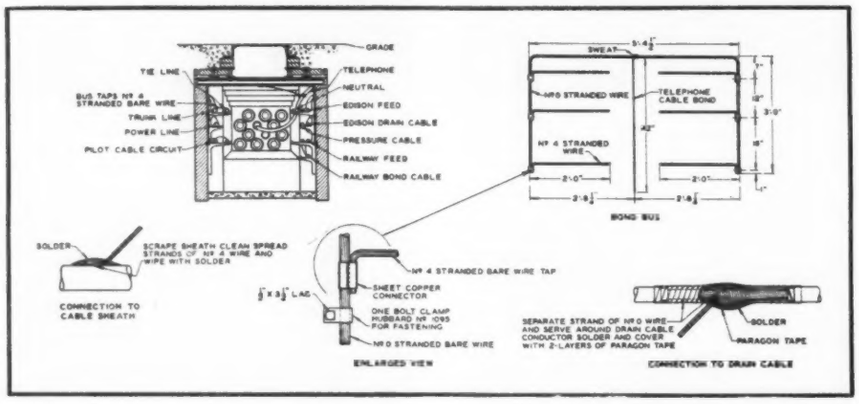
Precaution Needed With Aluminum Spray

Wherever aluminum paint is sprayed on transformer tanks and other equipment serious consideration should be given to preventing the metallic mist drifting and depositing where it may do harm or require expensive removal. This may occur indoors or outdoors. For example, some utility repair shops spray the equipment tanks in the same room where numerous high-voltage bushings and open tanks of insulating oil are exposed. If the air currents suspend the spray long enough to let it dry before depositing it may easily be wiped off bushings. But it is a different problem if it settles quickly and dries.

If not noticed it may lead to bushing flashovers. In one case the spray drifted 30 ft. and was sucked into two rotary converters by the ventilating air. Many hours outage will be needed to remove the accumulation. Sufficient aluminum spray may be deposited in exposed insulating oil to start an arc at the terminal board if the electrostatic forces line up the metallic particles.

When aluminum spraying is done around an outdoor substation some ingenuity must be exercised to prevent drifting of the mist, especially in a breeze. But inside a shop the foregoing hazards can be avoided by provision of a separate, well-ventilated room, or compartment, or exhaust hoods to remove suspended spray.

Bonding, Grounding and Draining of Sheaths in Underground Systems



Neglect in the installation of proper grounds is conceded to be a great source of trouble. Probably there are as many opinions about grounding as there are engineers and electricians. It is therefore important for each company to have definite standards for grounding. The following instructions and illustrations from the Detroit Edison Company may serve as an example of systematizing bonding instructions, even though conditions may call for different methods:

(a) Bonding

The sheaths of all lead-covered cables in Detroit Edison Company manholes shall be bonded together electrically, to protect against the possibly harmful action of stray or induced currents. Cables are divided by use into three distinct groups, as follows:

Multiple-conductor cables carrying a.c. transmission or distribution circuits.

Group "E"—Single-conductor or multiple-conductor cables carrying Edison d.c. circuits or a.c. circuits not included under Group "S" below.

Telephone, pressure wire, pilot wire, control, steam gage, etc., cables.

Group "R"—600-volt, d.c. street railway feeder cables.

Group "S"—Single-conductor cables carrying alternating current at 4,800 or 24,000 volts.

Bond together the sheaths of all cables belonging to Group "E" in each manhole as soon as possible after they are installed.

Do not bond in the sheaths of Edison d.c. neutral cables. These must be kept insulated from ground and all other cables as much as practicable.

Bond together, and to Group "E," the sheaths of any foreign cables such as fire alarm, police signal and telephone cables in every Detroit Edison Company manhole. The bonding of a single such cable in any manhole may be omitted (unless particularly specified) if that cable is of ½-in. diameter or smaller.

Bond together the sheaths of all cables belonging to Group "R" in each manhole.

Do not bond together or to the sheaths of cables belonging to other groups the sheaths of cables belonging to Group "S" except at the station or feeding end. At that end bond together the sheaths of all cables of this group as indicated in paragraph (e) below.

Allow no metallic connection between groups "E," "R" and "S" except at branch joints.

Jumper together the opposite halves of any old style insulating joints, using No. 4 stranded copper wire served and soldered.

Bond to the lead sheath the armor of an armored cable wherever such armor is made discontinuous by a joint in the cable (whether in a manhole or buried). Use No. 4 stranded copper wire served and soldered.

(b) Bond Bus

Where more than two cables of the same group enter a manhole the bonding connection shall be made by means of a bonding bus. This bus shall consist of a length of No. 0 stranded bare copper wire with taps of No. 4 bare copper wire, taken off with No. 2 copper bond connectors, for making connection to the individual cable sheaths. The bus shall be installed around the conduit entrance, being fastened to machine bolt shields set into the wall. The No. 4 taps shall be soldered to the cable sheaths. Two cable sheaths may be connected to the same tap, but this must be done in such a way that any current drained from a cable will pass through the tap conductor only and not be carried along the other cable sheath.

Where only two cables are to be bonded together in any manhole the bonding bus need not be used, the connection being made directly with No. 4 stranded bare copper wire.

(c) Insulation of Sheaths

Cables should be insulated from ground in manholes as much as is reasonably possible, in order to prevent stray currents in the sheaths. To this end care should be taken that the usual fireproofing covering be so installed as to completely separate the cable sheaths from the cable arms. Also, cables should be so trained as to be entirely clear of any pipe or other metallic structure.

In every manhole through which cables belonging to groups "R" or "S" pass a porcelain insulator shall be placed under each cable in the manhole to insulate it from cable arm.

(d) Drainage

Connect the sheaths of cables of group "E" to the conductor of the Edison drain cable in every manhole where such a drain cable exists, except in such locations as will be specially designated. These locations will be indicated in the field by a special tag, attached to the drain cable, the tag being inscribed "Do not tap conductor." Use No. 0 bare copper wire to connect the bond bus to the drain cable.

Connect the sheaths of cables of group "R" to the conductor of street railway (D.S.R.) bond cable in every manhole where such a bond cable exists, except in such locations as will be specially designated and indicated by the tag described above.

(e) Grounding of Cable Sheaths

Where lightning arresters are installed on the same pole with the pothead on a cable belonging to group "E" or "S" the lead sheath of the cable shall be connected to the lightning arrester ground connection wire, except in cases specially designated by the cable division of the electrical system as being unsuitable for such connection. The above connection shall be made by wiping an 18-in. pigtail of No. 4 bare wire onto the cable sheath at a convenient point as near the pothead as possible, leaving it neatly coiled. The overhead lines department will make the final connection of the other end of the pigtail to the lightning arrester ground wire. In case the arresters and ground wire are already installed the overhead lines department shall be notified when the cable and pothead installation are completed, so that they may make this connection.

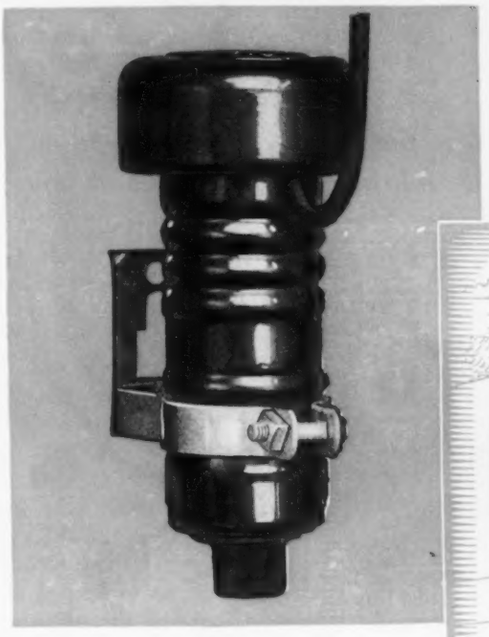
The sheaths of cables of group "S" shall be bonded together and to the station ground at the feeding end. The connection shall be made with two 1/16x1½-in. copper straps or equivalent.

At any substation, all grounds to which cable sheaths are connected shall be solidly connected together so that but one common ground mass shall exist on the substation property.

(f) Bonding to Foreign Cables

Occasionally, mutual protection is secured by bonding the sheaths of Edison cables to those of another utility or municipality by means of a short bond wire between adjacent manholes. Such connections shall be made only when and where specially designated by the electrical operating department. The size of wire and fuse, if one is used, will be specified for each such connection when it is ordered in.

HOW G-E ARRESTERS IMPROVE THE RETURN ON YOUR RURAL INVESTMENT



The Insignificant Additional Cost for Arresters Assures:

Lightning stresses on transformers limited to the minimum.

Primary-fuse blowing practically eliminated.

Development of power arcs, short circuits, and feeder outages prevented.

Possibility of primary power reaching secondary circuits definitely reduced.

And this Means for You:

Greatly decreased maintenance.

Largest return on over-all investment in rural extension.

A reliability of service conducive to load growth.

NO item in the total investment in rural distribution lines is so insignificant in first cost, yet so vital to the desired return on that investment, as valve-type arresters installed with every distribution transformer. Complete lightning protection by G-E pellet arresters adds, on the average rural extension, but a bare three per cent to the total investment. Yet these pellet arresters have demonstrated—time and again—their unsurpassed protective efficiency. Recently published A.I.E.E. papers contained such statements as these:

". . . the economy of providing lightning protection in the form of an arrester at each transformer has been quite well established."

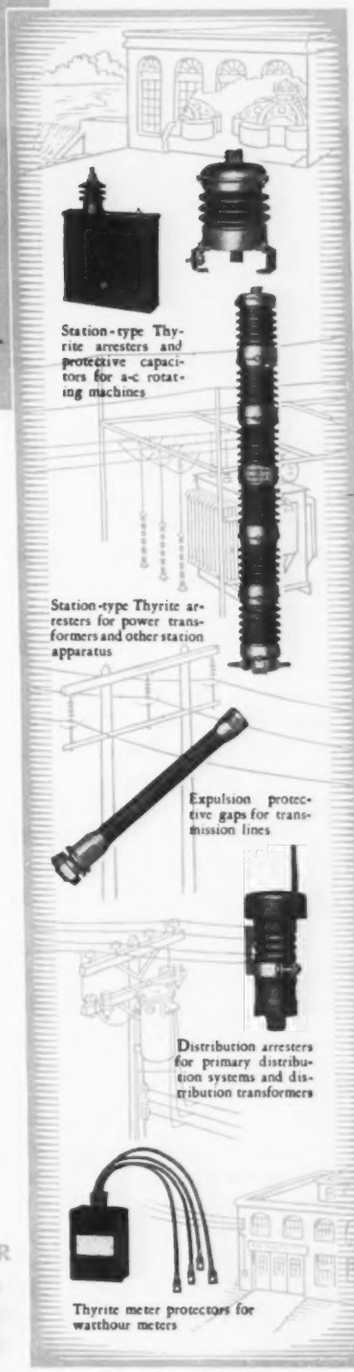
". . . about 60 per cent reduction in transformer failures and an even greater reduction in fuse blowings resulted when interconnection (of arresters) was introduced."

"Interconnection of the arrester ground with the secondary neutral has been found superior to other methods of protection."

". . . distribution arresters. . .have discharge capabilities entirely commensurate with discharge duties on distribution circuits."

". . .in the field measurements . . . no recorded discharge resulted in failure of arrester or the protected transformer."

Install G-E pellet arresters at every transformer—for the best return on your rural investment. General Electric Company, Schenectady, N. Y.


Station-type Thyrite arresters and protective capacitors for a-c rotating machines
Station-type Thyrite arresters for power transformers and other station apparatus
Expulsion protective gaps for transmission lines
Distribution arresters for primary distribution systems and distribution transformers
Thyrite meter protectors for watthour meters

COMPLETE LIGHTNING PROTECTION FROM THE GENERATOR TO THE METER

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Industrial ELECTRIFICATION

New ideas and practices in industrial electrification as presented by industrial, consulting and power sales engineers

Butt Welding Raises Strip Steel Output

By WALTER ANDERSON
and
MALCOLM CLARK
Taylor Winfield Corporation, Warren, Ohio *

At the end of the hot rolling process for producing strip steel the metal is covered with a heavy scale, which must be removed by the pickling process. The vats in which the stock is pickled often exceed 100 ft. or more in length and the stock is pulled through by large rollers. It is, therefore, necessary to fasten the end of one coil onto the beginning of the next coil in order to maintain the continuous flow of material.

There are two general methods used to join the stock together. One is known as "stitching" and is purely a mechanical bond. The other method is welding. In the case of light gage narrow strips, where the joining is merely for the purpose of maintaining a continuous flow of material, spot welding is used. In most cases a manually operated welder is entirely satisfactory, since the loose ends of the strips are readily handled and enough slack may be obtained to permit the use of this method. Where large width coils of heavy gage are encountered the problems are somewhat different. One of the methods made use of today consists of a large spot welder hydraulically controlled. The operator clamps the end of one strip and allows the beginning of the next strip to overlap by approximately 18 in., and then makes a double row of spot welds across the overlapped area. The stock is then released and continues through the pickling solution. On coming out at the other end the weld must be cut out. This serves its purpose of maintaining continuous flow through the pickling, but the coils must be manually handled before entering the cold rolling mill. In rolling single rolls considerable waste is experienced due to the loose ends. After cold rolling the strip is cleaned and the necessity for a second joining operation arises to keep a continuous flow of material through the cleaner. As the coils come through the cleaning process they are often cut into sheets for delivery to customer, and there is some waste here due to odd ends at the place where weld occurs.

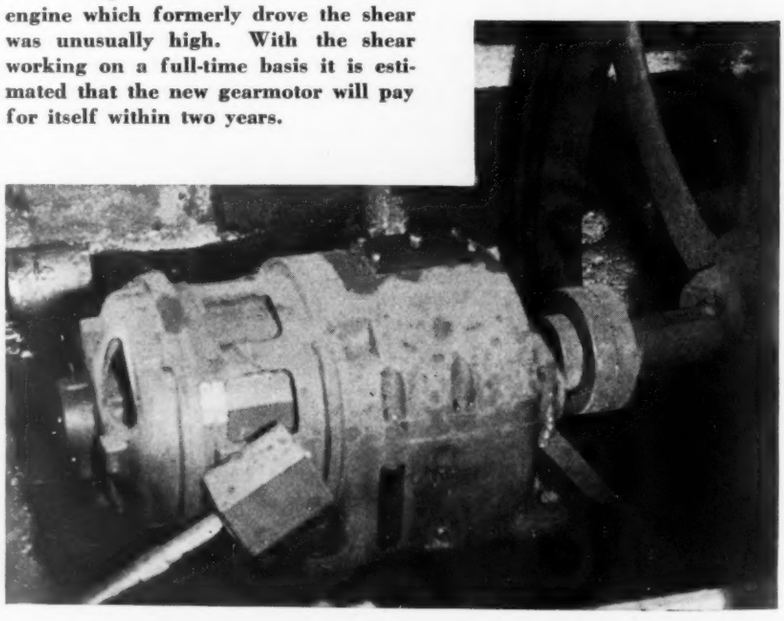
The trend in modern mills is to eliminate all the handling of coils and the waste of material due to loose ends. To accomplish this a butt flash welder is used just ahead of the pickling vats. A suitable pit is provided to take up the slack in order to allow time for welding. The stock processing is then continuous right through pickling, cold rolling and cleaning, the cutting at the end being done by flying shears.

A modern installation of this type provides for the butt flash welding, transferring from welder to trimmer and subsequent trimming of the weld

* From paper to Association of Iron and Steel Engineers.

GEARMOTOR REPLACES STEAM IN STEEL PLANT

The Vulcan Crucible Steel Company has replaced a steam-engine drive on a shear with a 15-hp. Westinghouse gearmotor. The gearmotor is direct connected to the shear through a flywheel which operates at 116 r.p.m. This drive is subjected to steel mill dust and scale. Maintenance and outage time on the old steam engine which formerly drove the shear was unusually high. With the shear working on a full-time basis it is estimated that the new gearmotor will pay for itself within two years.



Three 100-kva G-E Pyranol transformers installed at the plant of the Eli Lilly Co., Indianapolis, Ind.

Again

PYRANOL TRANSFORMERS SHOW SUBSTANTIAL SAVINGS IN INDOOR INSTALLATION

THE Eli Lilly Company of Indianapolis, manufacturing chemists, made a substantial saving in total installed transformer cost when it ordered G-E Pyranol transformers for this new installation. Short runs of secondary cable were desired, and Pyranol transformers could be installed at the load center without the expense of heavy vault construction. Installation of oil-filled transformers outdoors to save vault-construction expense would have entailed long secondary cable runs and would have marred the attractive appearance of the plant. This installation was made in the basement—the noninflammable, nonexplosive Pyranol transformers affording a high degree of safety.

● It will pay you to use Pyranol transformers for your plant—particularly if you are considering a new indoor installation. Recognition of Pyranol by the National Electrical Code permits their installation indoors with many of the restrictions applying to oil-filled transformers removed. More than 200,000 kva of these transformers are installed—many having been operating more than five years—all giving excellent service. For complete information write the nearest G-E sales office, or General Electric Company, Dept. 6A-201, Schenectady, N. Y. Ask for Bulletin GEA-2048.

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flash from both sides of the strip stock. The welders are of the latest automatic hydraulic type and give the operator full control of the welding operation at all times. A starting lever is provided, which, when moved forward, opens a valve and starts the welding cycle. The upset slide moves forward, at a predetermined speed with proper acceleration, and when the flashing period is finished the current is automatically cut off and the upset is made. The operation is entirely automatic, yet the operator may reverse the machine at any time by movement of a control lever. As a result of considerable experimenting, it has been found that welds made by machines of this type in low carbon steel are of such quality that when the stock is taken from the finished end of the cold rolling mill no evidence whatever of the weld can be found.

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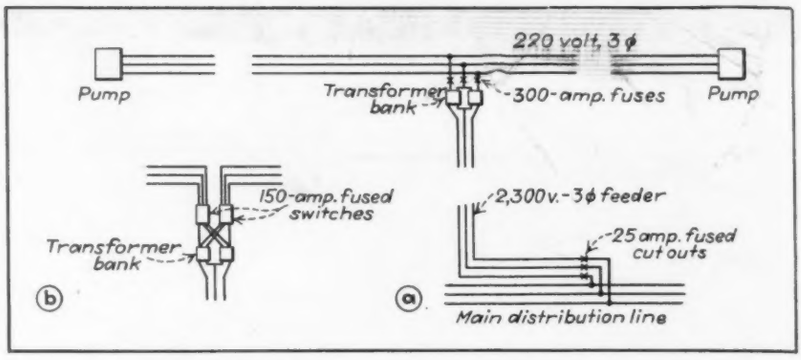
Split Circuits Reduce Fuse Ratings, Blowing

By K. B. HUMPHREY
Sayreville, N. J.

In a plant where several clay pits were being worked, one pit in particular, due to the lay of the land, had to be pumped regularly in order to keep the water within reasonable limits.

Two pumps were used, one having a 25-hp. motor and the other a 20. The pumps were located in small sheds at a considerable distance from each other and from the source of supply. A 2,300-volt feeder was run to a point approximately midway between the pumps and a bank of transformers set up to reduce the voltage to three phase, 220. The transformers were of 25 kva. capacity. Twenty-five-ampere fuses of the pole-mounting type were located at the point where the 2,300-volt line connected in with the main overhead feeder for the plant. The branch fuses could only be changed safely when the main distributing feeder was cut out.

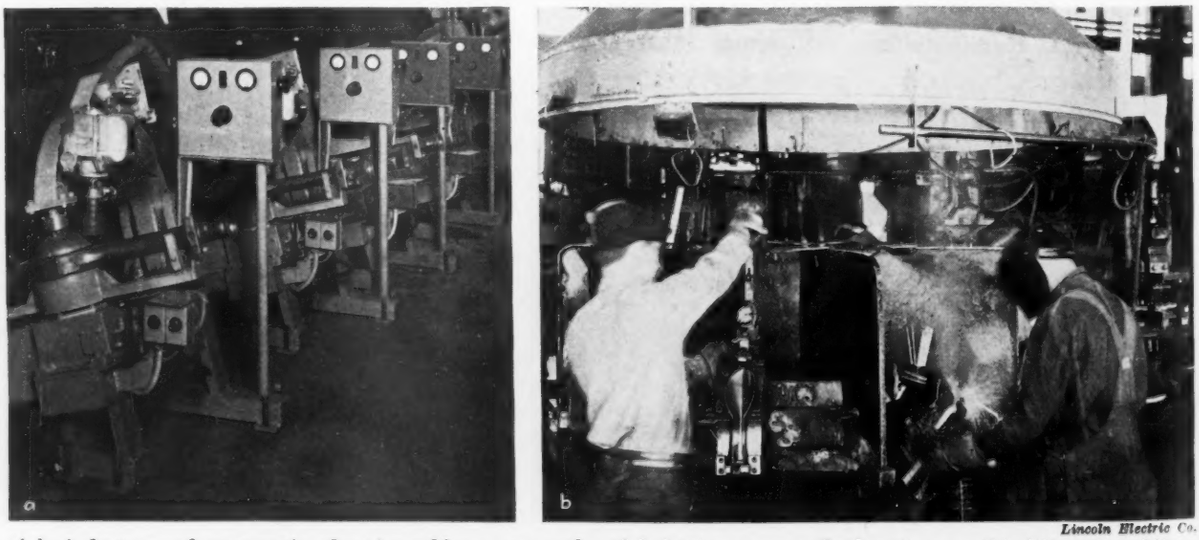


Subdivided circuit cuts down fuse maintenance

Due to conditions in the pit which could not be changed much trouble was had due to outages. Because of the large fuse on the secondary lines any trouble on either of the lines blew the primary fuses and shut down everything. Perhaps the original idea was that, the primary fuses being closer, it would be easier to change them than to go out into the pit when any trouble came up. Either set of fuses was inconvenient to change, so a box was mounted on the pole at a lower elevation and a door placed on it which could be locked. The meter and two safety switches were mounted in the box and fused as shown. When any trouble was had on either one of the pump lines only the fuse on that particular line went out and did not disturb the operation of the other pump. It was then only necessary to clear the affected line and put in new fuses.

Now when the pumps are to be shut down for a few days the switches (secondary) leading to the two lines are opened and there is no danger in working on the secondaries when changing them over from one location to another. The primary fuses have given no trouble since the arrangement was completed and much better all-around service has been maintained at the pumps.

Welding Steps Up Auto Production

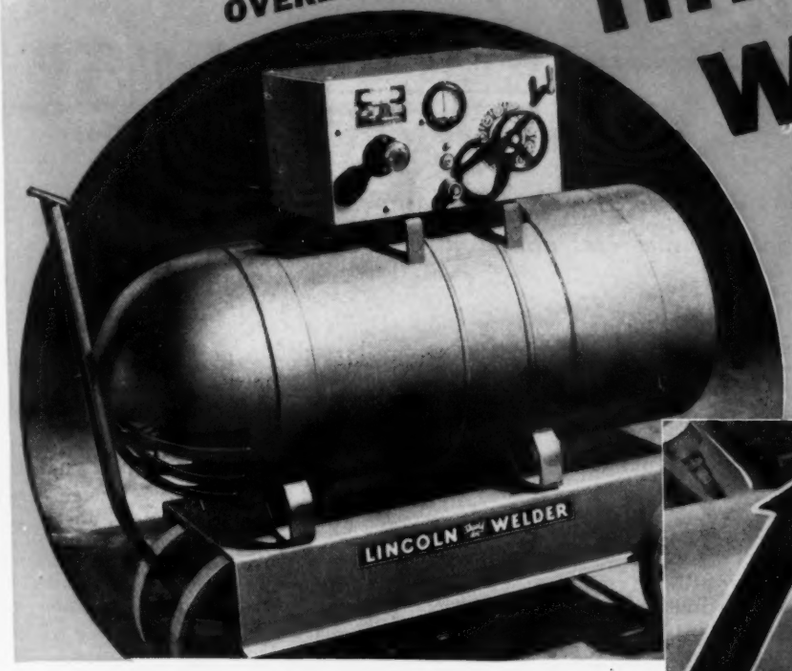


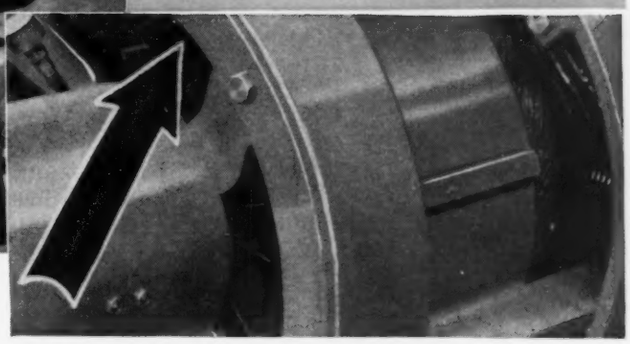
Lincoln Electric Co.

(a) A battery of automatic electric welders set up for fabricating rear axle housings. (b) Manual welding produces auto-lamp brackets at the rate of 450 per hour. These are but two examples of the part that welding plays in fabricating parts for practically every make of American automobile. Truck and trailer bodies, frames, axle housings, torque tubes, generator frames, lamp and tail-light brackets, brake cross shafts and many other parts are regularly welded

LET THE STORM STRIKE!
LET A FUSE BLOW!
OVERLOAD IT!

THIS WELDER WILL NOT BURN OUT!





The motor windings of the "Shield-Arc SAE" welder will not burn out because they are protected from overheating by a unique control device.

The New "*Shield-Arc* SAE" is completely self-protecting

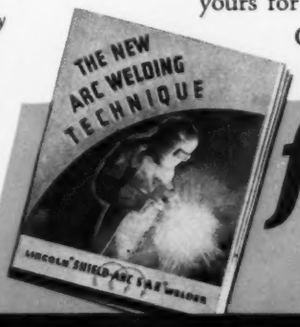
Here's how the New "*Shield-Arc SAE*" assures positive and complete protection from motor burnouts—

Starting—If any one of the phase lines is disconnected or a fuse is blown, the starter will not close. No danger of putting the welder on a single-phase line.

Running—When the windings of the motor reach maximum safe operating temperature *from any cause* . . . too frequent overloads, high room temperature plus overload, single-phase running at normal or heavy load, abnormally high or low voltage, phase unbalance or impaired ventilation . . . the welder automatically disconnects itself from the source of power!

So now, you can safeguard your welder investment by having a welder that will not burn out!

Learn *all* of the money-saving facts about the New "*Shield-Arc SAE*"! A total of 32 features are fully described in the book illustrated below. A free copy is yours for the asking. THE LINCOLN ELECTRIC COMPANY, Dept. NN-334, Cleveland, O.



free —This book, profusely illustrated, gives complete details about *The Complete Welder* . . . its operating features and its construction. The coupon will bring you a copy.

THE LINCOLN ELECTRIC CO.,
Dept. NN-334, Cleveland, Ohio
Please send a free copy of "The New Arc Welding Technique" to—
Name
Position
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"SHIELD-ARC SAE"

—the New Lincoln Welder with

DUAL Continuous CONTROL

and Self-Protecting Motor

Building Up THE LOAD

New ideas and practices in selling electrical equipment and service to industrial, commercial and domestic customers

Washington Schools Lead in Lighting

By AKSEL KNUDSTRUP

Lighting Engineer
Potomac Electric Power Company
Washington, D. C.

Perhaps the primary reason for the excellence of the school lighting in and around Washington, D. C., is the progressive attitude of local school authorities who have set standards here which have resulted in lighting second to none in this field.

Recently completed classrooms in Washington schools use four 500-watt semi-indirect opal-glass inclosing globes or open-type semi-indirect units in each room. An average illumination on the desk top of 25 ft.-candles has resulted, with a loading of about 2.7 watts per square foot.

A further improvement is specified for the new buildings now under construction. Totally indirect lighting will be used in the classrooms and drafting rooms. Six 500-watt units giving about four watts per square foot of floor area will be used in the classrooms. The average drafting room and science room will use eight 750-watt units, or about 5.8 watts per square foot. Illumination in the classrooms will be about 38 ft.-candles and in the drafting rooms 52.

School superintendents are unanimously in agreement that better lighting of the schools has created a more restful spirit among the students, has made learning easier and created a better atmosphere. The assistant superintendent of Washington, D. C., schools further states that posture of students is improving, thus giving the correct condition for the spine while studying. This, too, may be partly traceable to better lighting.

In order to promote and attain the foregoing mentioned school-lighting jobs it was necessary to obtain the entire confidence of the authorities having jurisdiction. Correct engineering advice was always given when required. The importance of ample lighting with a minimum of glare was stressed at all times. Surveys of old, inadequately lighted schools were made, with recommendations for improving them. The performance and satisfaction of the students in the better-lighted schools were then compared with those in the inadequately lighted schools and the distinct advantages of the student conditions in the better-lighted schools were so apparent that the classroom lighting has progressively improved.

Average intensity in this classroom of the Woodrow Wilson High School, Washington, D. C., is 38 ft.-candles. Six semi-direct lighting units are used, each housing a 500-watt lamp

•

"Free Silver" Spurs Lamp Sales

In a campaign intended to bring the advantages of I.E.S. lamps within the reach of every customer the Kansas City Power & Light Company has been exchanging silver dollars for each lamp order brought in by employees.

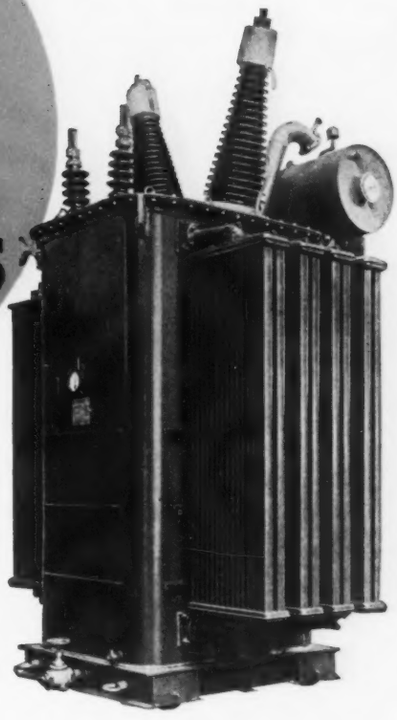
Two special campaign I.E.S. lamps, a table study model and a floor study model, have been made available to company customers at $3.45 and $6.95, plus tax, respectively.

In addition to a grand prize of a special silver lamp for the employee turning in the most orders for the campaign, prizes of five silver dollars were awarded each week to the employee in each sales group who turned in the most orders for lamps that week.

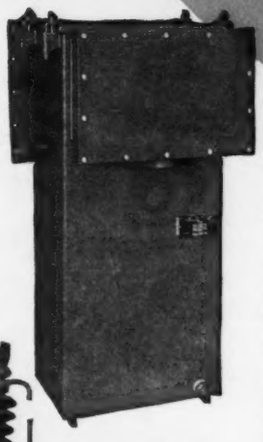
To supplement the efforts of the

Distribution Transformers

FOR DEPENDABLE SERVICE USE Wagner Transformers



Power Transformers



Lighting Transformers

Auxiliary Power Transformers

Ask for WAGNER BULLETINS
180-Distribution Transformers
181-Power Transformers

WAGNER transformers are of sturdy construction and are liberally designed to withstand abuses and to operate at all times at high efficiency. They meet demands for reliable service under all conditions.

The Wagner line includes every type and size of power and distribution transformers, enabling Wagner to supply all your requirements. Call on Wagner! Forty-five years' experience in the electrical field is at your disposal.

TT237-1B

Wagner Electric Corporation
6400 Plymouth Avenue, Saint Louis, U.S.A.

employees advertisements featuring the advantages of I.E.S. lamps were run in local newspapers each week. The campaign also paralleled the national advertising campaigns conducted by the lamp manufacturers. More than 240,000 copies of these advertisements were circulated in Kansas City homes during the fall months. This is an average of two advertisements per family in Kansas City.

In outlining the campaign to employees it was pointed out that the benefits of the campaign were threefold. It brought eye comfort and protection to the customer, "free silver" to the employee and increased load and revenue to the power company.

•

Survey Card Helps Increase Farm Usage

By **FRANK M. MASON**
Farm Service Agent
The Detroit Edison Company *

Much can be gained by making an analysis of each farm on the utility lines and studying the possible use that could be made of electricity in each individual case. The farmer could be furnished with a written plan for equipping his farm, showing him just what each application would mean to him. We must fit instruction to individual needs.

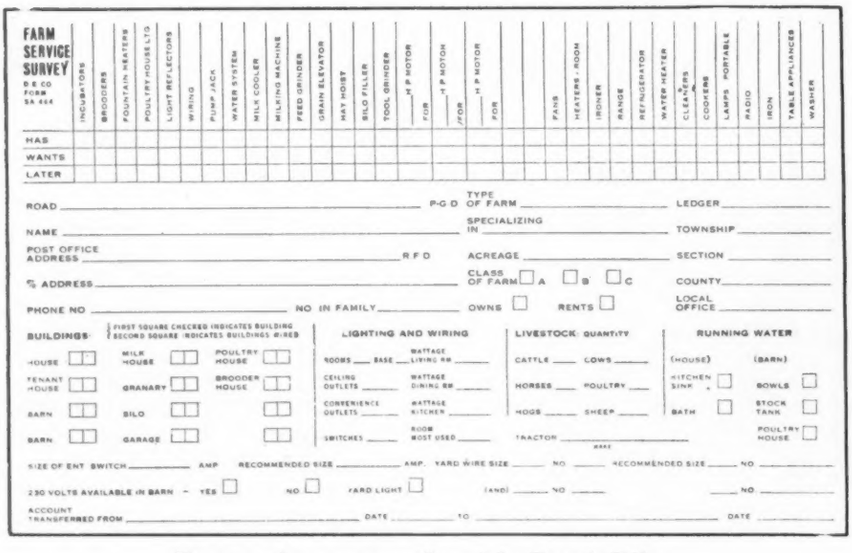
A complete card file of all farms should be maintained by the farm department. This card file should show such information as: Type of farm, class of farm, acreage, livestock normally kept, if the farmer specializes in any particular phase of agriculture, list of buildings showing those wired, size of service entrance, size of circuits to the barns, present load record, and what the farmer's next addition to his equipment will be.

From the above information it can pretty well be determined what possible use can be made of electricity on each farm. These cards should be grouped in townships, and if a road name and house numbering system is available the cards should be filed alphabetically as to road name and numerically as to house numbers on each road.

It will be found that a farm file such as outlined would be very beneficial when it comes to co-operating with dealers. For instance, if a water system dealer asks for a list of prospects, it will be found a simple matter to furnish such a list, as well as any other type of dealer, and these lists should be furnished to dealers. The list can easily be made up if each application is listed at the top edge of the survey card in such a manner that signals of three different colors can be clipped over the top edge of the card. The signals will come in rows for each type of application, the color representing whether the farmer has the equipment, is interested in the equipment or if the equipment could be used to good advantage on that farm.

Upon making a survey it will be found that any group of farms will come under three classifications, one group will be of the aggressive type or the leaders, another group will be of a type that can go only a limited way with any program and would have to confine its uses of electricity to a few lamps, an iron or radio, but between these two extremes will be found a great bulk of so-called average farmers. It will be with this average class of farmer that we must put most of our effort toward a load-building program.

* From paper to Rural Electrification Conference, Purdue University.



Farm service survey card used by Detroit Edison

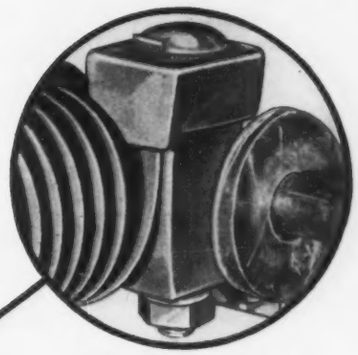
Mail Campaign Sells Ranges to Prospects

A carefully thought-out direct-mail campaign plus a follow up of a personal call by a salesman is bringing results in San Diego Consolidated Gas & Electric's 60-day range and water heater campaign, the quota for which is 240 ranges and 150 water heaters. The direct-mail campaign consists of four letters sent out over the salesman's signature to a selected group of prospects. Each letter emphasizes one particular feature of electric cookery, the first also telling of the results of a recent field survey from which the company learned that the average customer would buy a range if the monthly payments were less than $4, a water heater if the payments were less than $2 and the combination if the payment could be made less than $6.

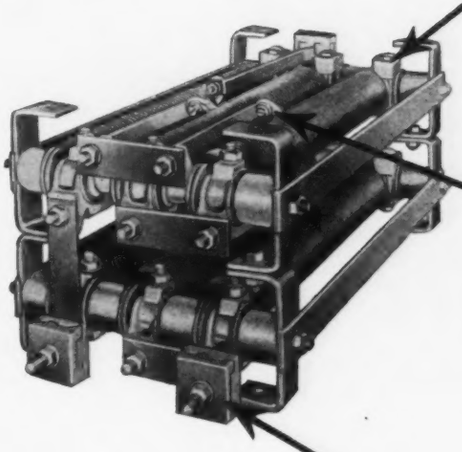
In the campaign the only prices quoted are the installed price of the combination range and water heater, which was set up to be $5.33 per month. Publicity included the 1-cent rate for controlled water heating when used in combination with a range.

Letters were timed to go out ahead of the salesmen and were mailed at the rate of ten per day per salesman. The success of the campaign may be judged by the fact that after the first letter eighteen range sales were made in two days to the prospects. After the four letters had been mailed the salesmen called as a follow up, and if unsuccessful a fifth letter crammed with sales points was sent, the last letter being signed by the district agent. At this time complete reports of the results of the campaign are not available, but to date results indicate that this plan will prove a very effective method of converting electric prospects into range and water heater users.

a Heavy Duty Resistor
with
Perfect Contact Terminals



End Terminal



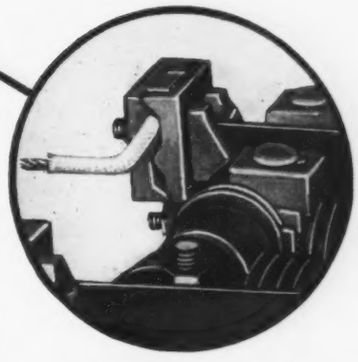
Wedge-type malleable End terminals . . .

Heavy pressed steel Tap terminals . . .

Large malleable Cable terminals . . .

All heavy cadmium plated to prevent rust . . .

Tap Terminal



Cable Terminal

Monitor

Monitor builds resistors for every class of service—*Smooth-wound* for low-currents, *Hex-wound* for intermediate currents, *Edgewound* for heavy currents and *Edgewound Mill Type* for applications involving heavy currents, severe service and rough usage.

Special mountings are available for applications where standard mountings are not entirely suitable; quotations on same will be furnished on receipt of full information concerning the requirements. Monitor Sales Engineers in principal cities will gladly consult with you. Write us.

THE New Monitor Mill Type Resistors are constructed for heavy currents with terminal connectors that can really take it. . . These terminals provide a perfect electrical connection equal to a welded joint but with the advantage of adjustable position. . . . The Tap terminals grip the ribbon in four places with ample contact surface and vise-like pressure. The wedge-type End terminals and Cable connectors are large malleable castings providing the proper dissipation of heat at these vital points and by virtue of their design assure a perfect electrical connection. . . . These resistors will operate at high temperatures without damage, which makes them especially suitable for installations in steel mills, cranes, locomotives, and other equipment subject to severe vibration and shocks, involving heavy currents and general rough usage.

Monitor Controller Company

Gay, Lombard & Frederick Sts. BALTIMORE, MARYLAND

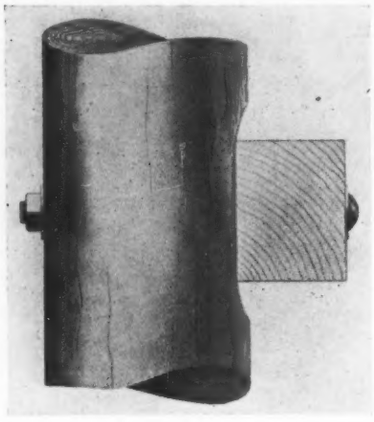
Monitor Edgewound Resistors

New ENGINEERING IDEAS

Discoveries, proposals and developments by electrical engineers and scientists in the field, the factory and the laboratory

New Concave Gain for Cedar Poles

Finding that users were generally satisfied with the service life of the butt section and body of poles, but made some comment on top failures, M. H. Sperry, vice-president and general manager the Valentine Clark Corporation, St. Paul, Minn., inspected several thousand used cedar poles and traced a majority of these top failures to the sapwood decay below the crossarm area. More particularly, it was found that decay often started at, and progressed from, the small ledge effect at the bottom of the conventional mitered gain. During heavy rains the outer sapwood layers of the crossarm section become saturated with water. Since the ledge is protected from the sun by the crossarm, it dries out more slowly. And thus ideal moisture conditions are set up for the germination and development of fungi spores.



New style concave gain permits more rapid drying of wood fibers at crossarm

So a new gain was designed, one which is slightly concave. Since this type of gain eliminates the ledge effect, it permits the drainage of water below the crossarm and prevents the accumulation of excess moisture. Besides this, the concave gain provides greater freedom in leveling up the crossarm. The gains are machine-incised and treated with green creosote stain for further protection against decay.

•

Photo Cells Control Biggest Swing Bridge

Three "electric eyes" control the center span of the new road bridge over the River Forth, Scotland. These photo-electric cells, which have never before been used for such a purpose in Britain, put the 1,600-ton swing span —said to be the largest in the world— into alignment with the roadway when it swings into the closed position.

One cell sees whether the span overshoots the mark; another sees that it does not overshoot, while the third watches for "dead center."

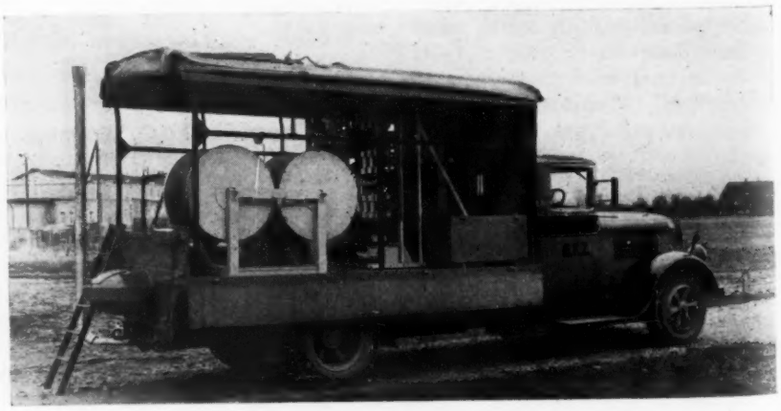
The bridge is just over ½ mile long. It has taken three years to build, and the 120-yd. center span is so delicately poised on its pivot that it requires only two 50-hp. electric motors to swing it open to river traffic.

•

Synchroscope Saves Steps in Meter Lab.

When using a sine wave generator to supply energy for testing purposes in the meter laboratory the frequency has to be watched and kept constant just as are the current and potential values. Controls for the latter are usually right under the operator's hand as he works at the testing table. But the frequency meter is usually mounted on the generator switchboard, which may be some distance away and the frequency indicator difficult to read without walking up to it.

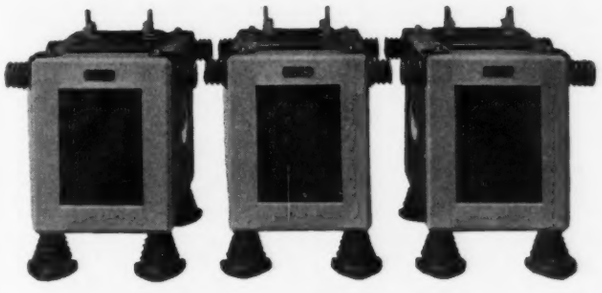
This is not necessary in the meter laboratory of the Dallas (Tex.) Power



Swiss system puts 100-kva. generator on truck

Skyview by H. H. Harris, Pres't, General Alloys Co., Boston

IN BOSTON



The feeder reactors illustrated are rated, 67 KVA., 13.2 KV., 60 Cycles and are for installation in superimposed individual compartments.

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Designed for all kinds of services—indoor or outdoor—for line voltages up to 33 KV., for currents up to 5,000 amperes. Murray Current Limiting Dry Type Reactors consist of concentric stranded, enamelled and asbestos insulated conductors mounted in a concrete housing.

Efficiencies are guaranteed and the ability of Murray Reactors to withstand severe short circuit conditions is a matter of record. Practically every large system in the country is protected by them.

For positive protection against short circuits install Murray Current Limiting Reactors.

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MURRAY LOW LOSS REACTORS

& Light Company even though the sine wave generator board is across the room from the testing table. An old synchroscope, salvaged from a powerhouse reconstruction job, is mounted on the switchboard. It is connected between the sine wave generator and the utility system and is left in circuit. It thus shows continuously the relation between the testing and the system frequencies. Considering the system frequency to be constant, which may safely be assumed under normal conditions, the synchroscope pointer will stand still or rotate forward or backward according to the speed of the sine wave generator.

•

Breakdowns Met by Portable Generator

When local service of important nature is interrupted on the system of the Elektricitatswerke des Kantons Zurich, Switzerland, a portable generating plant is used with success. The power unit is carried in a framework mounted on a truck platform so that it can be lifted off when the truck is needed for other duties. (See illustration on page 78).

The power unit consists of a 95-hp., six-cylinder engine fitted with two radiators for cooling efficiently when operating steadily for a long period. This engine is coupled to an alternator of 100 kva. wound for 380 volts, 50 cycles and a transformer is provided for stepping the current to lighting or power requirements. Cable drums mounted on the truck platform carry sufficient cable for making connections to the lines where a breakdown occurs.

•

Shorten Calculations for Braced H-Frames

By BERTRAM E. ELLSWORTH
Iowa-Nebraska Light & Power Company, Lincoln, Neb.

Bracing of H-frames has come into general use where it is desirable to use small poles with braces for straight-away construction or where a side load is encountered, such as at small angles or corners in a line. Formulas for calculating this type of fixture are rather complicated, so the accompanying chart has been prepared to simplify the work of designing these structures. While the values in the chart are for W.R.C. poles, yet it should be sufficiently accurate for S.Y.P. poles. The method of using the chart for straight-away lines is as follows:

Select the wire constant from the table and draw a line from this constant through the structure safety factor desired and extend until it intersects the Q line. Then from the span length to be used draw a line through this point on Q and project until it intersects the load scale. This is the ultimate load the structure must carry. Project to the right from this load to the vertical line representing the pole height and dimension "L" to be used, which will give the class of pole necessary to use. The guide lines on the chart are for a line using five No. 2/0 copper conductors, with a 600-ft. span for pole safety factor of four. With L equal to 30 ft. and a 50-ft. pole, a class 2 pole must be used. For use in bracing a corner structure calculate the ultimate load to be carried and locate this value on load scale and proceed as before.

The following items should be noted: The wire transverse constants are for copper, heavy loading district. For other conductors or other districts use constants from the Electrical Safety Code. The chart can be used equally well for structures using two or more sets of braces.

Wind pressure on the poles has been neglected as it is relatively small on long lines of this type. This pressure may be calculated and added to the load on the load scale, if desired. Ordinarily pole dimensions will run over the minimum sufficiently to compensate for wind pressure on the poles and weakening of poles due to holes bored in the poles for securing the X-braces.

If the top of the braces is to be placed more than 4 ft. below the crossarm carrying the load the strength of the pole above the braces should be investigated. Unless the dimension "L" is very small or the structure is to be set in sand or other loose soil, the pull-up on the rear pole will not be found to be serious.

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The author of "Apparatus Simplifies Jewel Inspection," in these pages of the November 21, 1936, issue, was P. E. Alger and not P. L. Alger as printed.

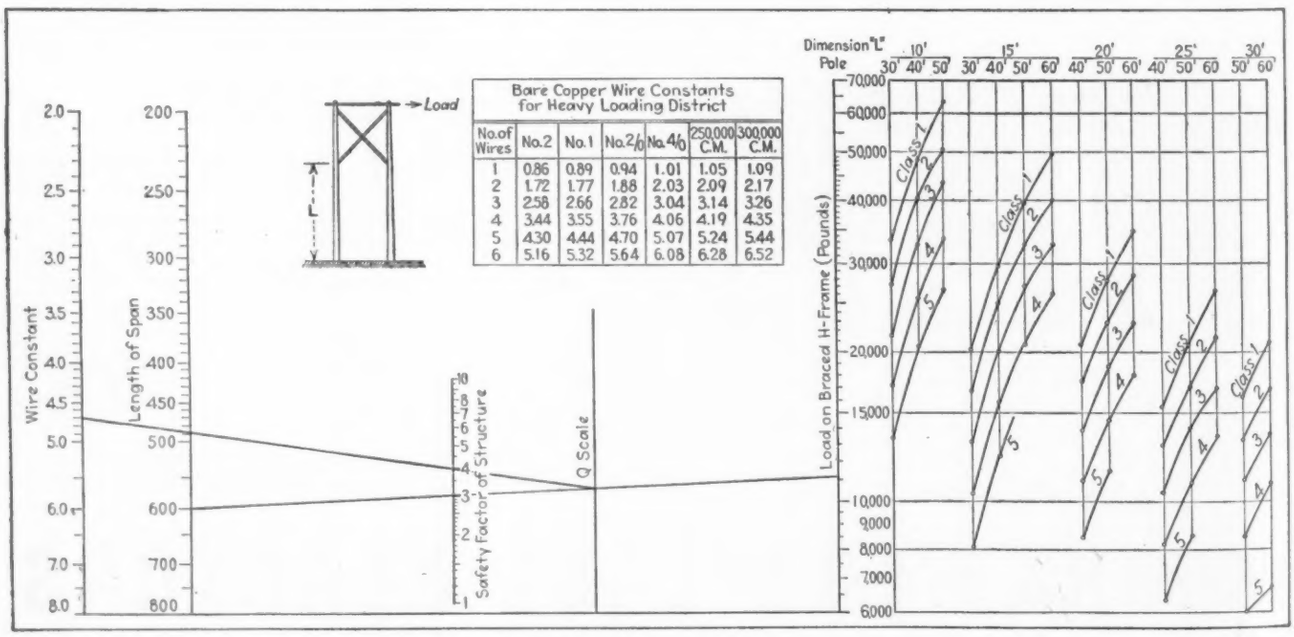
Load
L
Bare Copper Wire Constants for Heavy Loading District
No. of Wires | No. 2 | No. 1 | No. 2/0 | No. 4/0 | 250,000 C.M. | 300,000 C.M.
1 | 0.86 | 0.89 | 0.94 | 1.01 | 1.05 | 1.09
2 | 1.72 | 1.77 | 1.88 | 2.03 | 2.09 | 2.17
3 | 2.58 | 2.66 | 2.82 | 3.04 | 3.14 | 3.26
4 | 3.44 | 3.55 | 3.76 | 4.06 | 4.19 | 4.35
5 | 4.30 | 4.44 | 4.70 | 5.07 | 5.24 | 5.44
6 | 5.16 | 5.32 | 5.64 | 6.08 | 6.28 | 6.52
Wire Constant
Length of Span
Safety Factor of Structure
Q Scale
Dimension "L" Pole
Load on Braced H-Frame (Pounds)
Class 1
Class 2
Class 3
Class 4
Class 5

Chart for H-frame calculation

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News ABOUT PEOPLE

R. J. Cordiner Appointed to New Executive Position

Under an important organization change in the appliance and merchandise department of the General Electric Company, announced by C. E. Wilson, vice-president in charge,

Ralph J. Cordiner, formerly manager of the company's radio sales division and chairman of its radio management committee, has been made assistant manager of the department, reporting directly to Mr. Wilson.

Since December, 1930, when Mr. Wilson was appointed vice-president of the General Electric Company, the position of manager of the appliance and merchandise department has been vacant, Mr. Wilson continuing all of his former duties as manager as well as assuming those of vice-president.

Although one of the youngest men in the electrical industry to hold so important a position, Mr. Cordiner's experience has been exceptionally broad. Widely traveled and personally acquainted with practically the entire personnel of every G-E distributing house as well as with a great many dealers, Mr. Cordiner is also well known among other electrical manufacturers through his keen interest and active participation in industry activities.

•

▶ ABRAHAM C. WEBBER, formerly a member of the Massachusetts Department of Public Utilities for four years and lately of the state Tax Appeals Board, has been made chairman of the utilities commission, succeeding John J. Murray.

•

D. B. Mackie New Sales Head for Curtis Lighting, Inc.

Duncan B. Mackie has recently become sales promotion manager of Curtis Lighting, Inc., Chicago. Formerly an advertising executive of the Benjamin Electrical Manufacturing Company and later advertising manager for Schweitzer & Conrad, Inc., Mr. Mackie's extensive experience in the electrical field has equipped him well for the important

position of stimulating and guiding the promotional activity of Curtis Lighting, Inc., during this period of rapid expansion.

H. C. Mealey Appointed Head of Hotpoint Refrigeration

Harry C. Mealey, a member of the General Electric Company organization for eighteen years, has been appointed to head the Hotpoint refrigeration division of the Edison General

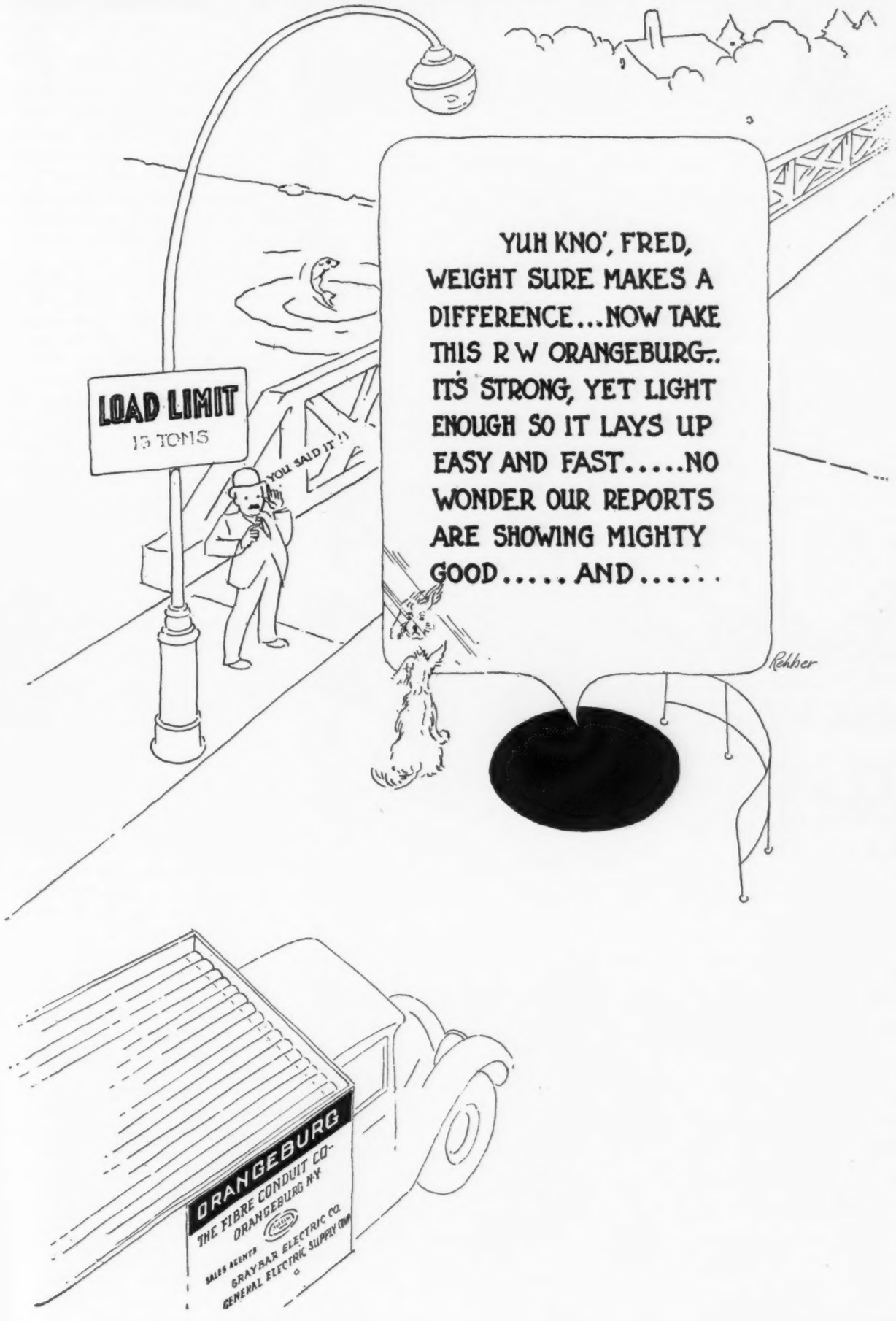
Electric Appliance Company of Chicago. Mr. Mealey's appointment follows four years service as manager of Hotpoint refrigerator sales in Cleveland before the line was merged with other Hotpoint major appliances for distribution through the Edison General Electric Appliance Company. He has been active in the refrigeration field for more than ten years.

•

Public Utility Engineering Announces New Appointments

Henry C. Cummins, vice-president in charge of operation and engineering of Public Utility Engineering & Service Corporation, announces the following appointments in the operating and engineering department:

E. D. Uhlendorf executive engineer; F. H. Lane, manager engineer division; A.


LOAD LIMIT
15 TONS
YOU SAID IT!!
YUH KNO', FRED, WEIGHT SURE MAKES A DIFFERENCE...NOW TAKE THIS R W ORANGEBURG-. ITS STRONG, YET LIGHT ENOUGH SO IT LAYS UP EASY AND FAST.....NO WONDER OUR REPORTS ARE SHOWING MIGHTY GOOD..... AND.....
Rehber
ORANGEBURG
THE FIBRE CONDUIT CO.
ORANGEBURG N.Y.
SALES AGENTS
GRAYBAR ELECTRIC CO.
GENERAL ELECTRIC SUPPLY CORP.

H. Kuhn, manager valuation division; W. C. Drummond, power production engineer; H. W. Eales, chief electrical engineer; H. S. Whiton, chief mechanical engineer; H. G. Robey, chief hydraulic engineer; L. J. Willien, chief gas engineer; W. J. Welch, chief design engineer; Stephen Wehner, hydraulic engineer; D. C. Hormell, mechanical engineer; H. O. Mathews, automotive engineer; J. A. Agee, budget control engineer.

•

T.V.A. Officials Resign

Resignations of three important officials of the T.V.A., two shifts in personnel and the appointment of a construction engineer for Hiwassee Dam in western North Carolina have been announced by the board of directors.

W. I. Nichols, head of division of electrical development; E. Falck, director of the division of rates and research, and Edwin Whipple, construction superintendent for Chickamauga Dam, have resigned. Fred C. Schlemmer, construction superintendent at Norris Dam, was named construction superintendent for Chickamauga Dam. Dr. Martin G. Glasser was appointed acting director for rates and research division. He is on a year's leave from University of Wisconsin. Carl A. Bock, assistant chief engineer, announced that Olaf Lourgaard, general office engineer, has been promoted to the position of construction engineer on the Hiwassee Dam.

•

Merger in New York Brings Important Personnel Shifts

Important changes in personnel were made in connection with the recent merger of seven affiliated companies into Consolidated Edison Company of New York, Inc. Officers of Consolidated Edison Company are now as follows:

Floyd L. Carlisle, chairman of the board; Frank W. Smith, president; Oscar H. Fogg, executive vice-president; F. H. Nickerson, vice-president—system, electric and gas—finance, accounting, statistical; R. B. Grove, vice-president—system, electric and gas—commercial relations, legal bureau including claims and investigation, rate bureau; R. H. Tapscott, vice-president—system, electric—engineering operations; A. H. Kehoe, vice-president — system, electric — construction; W. C. Morris, vice-president—system, gas—engineering operations, and—system, electric and gas—real estate and commercial buildings; J. F. Becker and E. F. Jeffe, vice-presidents—system, electric—sales; J. C. Parker, vice-president—system, electric and gas—research and development; Philip Torchio—system, electric and gas—duties as assigned; John Stilwell, vice-president—system, electric and gas—personnel, medical, payroll, transportation, insurance; W. W. Erwin, vice-president—system, electric and gas—purchasing and stores; N. T. Sellman, assistant vice-president—system, gas—sales (gas and coke) customers service, including meter repair shops; Herbert C. Davidson, secretary and John R. Fenniman, treasurer.

•

OBITUARY

Col. R. A. Mitchell

Col. Reuben A. Mitchell, one of Alabama's pioneers and a senior vice-president of Alabama Power Company, died, after a lingering illness, on January 10 at his residence in Birmingham. In the passing of Colonel Mitchell Alabama loses one of her most beloved and respected citizens.

With his brother, Sidney Z. Mitchell, and associates, Colonel Mitchell played an important part in the elec-

trical development of Alabama. By the purchase of utility companies in Decatur, Huntsville, Talladega, Anniston and other cities, they formed an important nucleus of what later became one of the key parts of the Alabama Power Company's statewide system of power development and distribution. The first line for the transmission of electric power between cities in the state was built by Colonel Mitchell and associates. It connected Talladega, Anniston and Gadsden.

Shortly after the small utility companies in which Colonel Mitchell was interested were acquired by James Mitchell (no kin) and associates, he became a vice-president of Alabama Power Company, and to the time of his death retained his keen interest in the further development of the industrial resources of Alabama. Colonel Mitchell was 83 years of age.

J. F. Max Patitz

J. F. Max Patitz, chief consulting engineer Allis-Chalmers Manufacturing Company, Milwaukee, Wis., died suddenly, of a heart attack, January 3. He was associated with Allis-Chalmers for more than 51 years, nearly 26 of which he served as consulting engineer. Mr. Patitz was born at Mugeln, Saxony, in 1866, and after finishing a course in the Royal Gymnasium of Dresden he came to the United States.

He entered the employ of the E. P. Allis Company in 1885, where his native ability was soon recognized both by E. P. Allis and the late Edwin Reynolds of steam engine fame.

Mr. Patitz became one of the company's designing engineers and in 1901, when the E. P. Allis Company became part of the Allis-Chalmers Company, he was placed in charge of the building of steam engines and compressors. As early as 1899 Mr. Patitz saw the possibilities of the steam turbine and in 1902 was sent abroad to investigate some of the existing types there, and on his return did much to further the building of steam turbines by the company. He was granted many useful patents and was an authority on intricate mathematical calculations connected with machinery design.

•

▶PAUL H. SMITH, for the past ten years manager of the Detroit district of Combustion Engineering Company, Inc., died at Detroit November 23 following a lingering illness. A graduate of Lehigh University, Mr. Smith was identified with the Westinghouse Electric & Manufacturing Company, Pittsburgh & Butler Street Railway and the Brooklyn Edison Company before he joined the Combustion Engineering organization in 1926. He was a member of the American Society of Mechanical Engineers.

▶CHARLES W. MOWRY, one of the outstanding fire protection engineers of the United States, and manager of the inspection department of the Associated Factory Mutual Fire Insurance Companies, Boston, died suddenly in that city, December 19. He was born at Fall River, Mass., educated at the Massachusetts Institute of Technology, and was a member of numerous engineering societies and a frequent contributor to the technical press.

Human Engineering—Salvation of Industry

[*Continued from page* 36]

that complaints and accidents resulted? What else could be expected?

But the most painful, disappointing aspect of that entire situation was the fact that the management responsible for keeping that superintendent on the job insisted, for a long time, that he was a very valuable man to the company. I am reminded of the old adage, "There are none so blind as those who will not see."

A contrasting example is found in an incident told about Carl Gray, president of the Union Pacific System.

Gray writes disappointed operator

Mr. Gray was on the observation platform of his private car as the train pulled through a little station without stopping. The station operator, knowing his chief was on that train, was standing outside the station and waved a friendly salute to the big boss as the train rolled through. Unfortunately, the boss had his mind focused on something else and failed at the moment to notice and return the friendly greeting. (You can imagine the chagrin and the disappointment of that employee who undoubtedly believed his chief had deliberately ignored him.) President Gray suddenly became conscious of what had happened and, calling his secretary, he dictated a letter of apology to that employee! Foolishness? No, the smartest action possible of a leader, big mentally, with a keen understanding of human nature.

Mr. Gray explained to those associates who overheard that dictation, "I wouldn't for the world have any employee of ours feel he had been deliberately ignored, for with such a feeling in his heart he would unconsciously react the same way to some patron of ours. I would never know and could never correct the damage which might accrue."

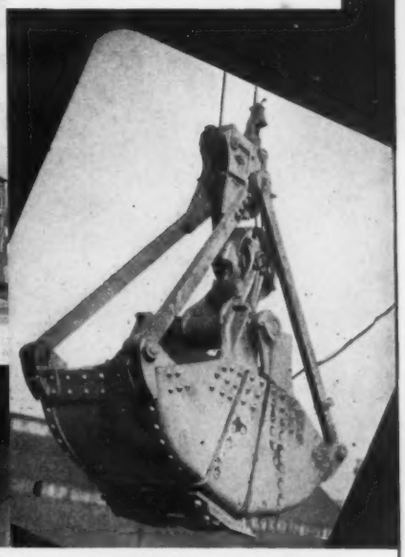
What a keen understanding of human engineering—what a beautiful example for a chief executive to set before his subordinates.

You, in managerial positions, will be well repaid for investigating the human engineering phase of your business. Analyze the internal and external reactions to your company's policies. Analyze the actions and reactions of every employee who dis-

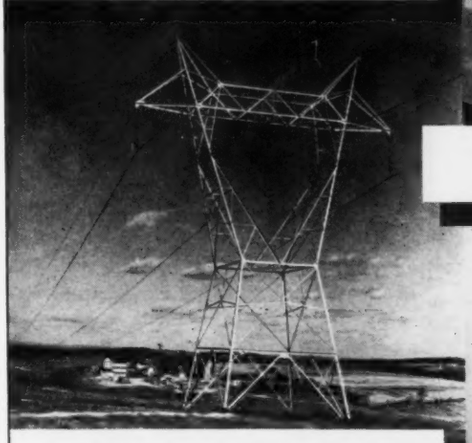
BLAW-KNOX Products
for public utilities

The merit of Blaw-Knox Products has been endorsed by their acceptance under the rigid standards of Public Utility purchasing for more than 2 decades

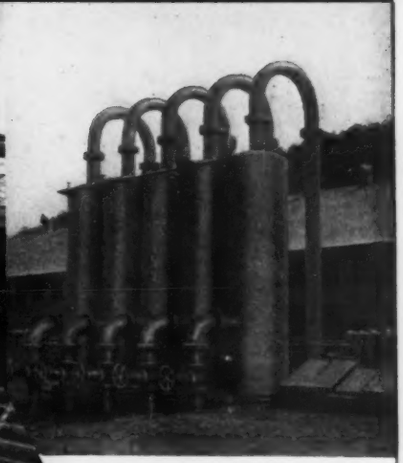
STEEL BUILDINGS



CLAMSHELL BUCKETS



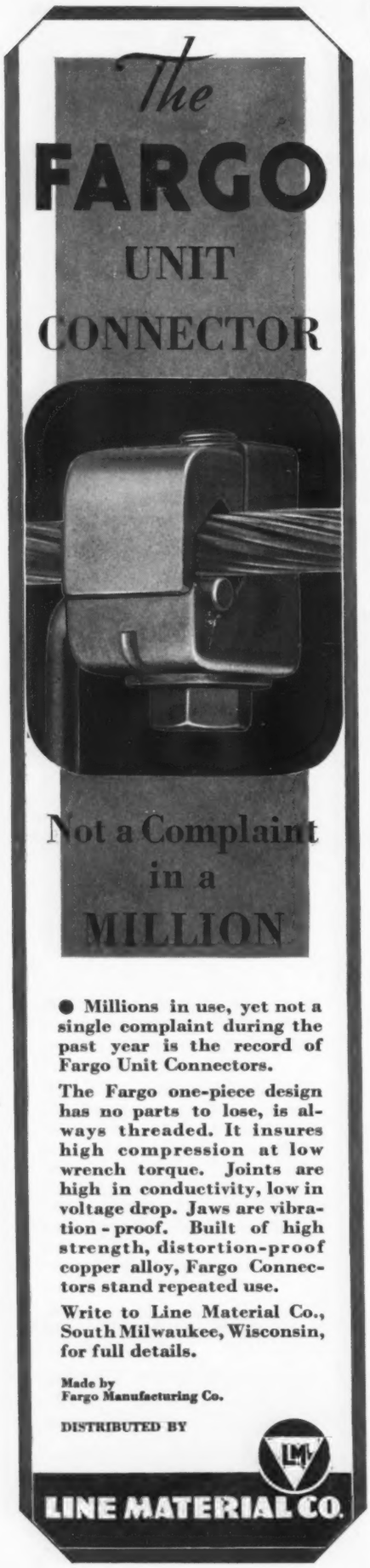
TRANSMISSION TOWERS



GAS CLEANERS

STEEL GRATING

BLAW-KNOX COMPANY
2013 FARMERS BANK BUILDING
PITTSBURGH, PA.



● **Millions in use, yet not a single complaint during the past year is the record of Fargo Unit Connectors.**

The Fargo one-piece design has no parts to lose, is always threaded. It insures high compression at low wrench torque. Joints are high in conductivity, low in voltage drop. Jaws are vibration-proof. Built of high strength, distortion-proof copper alloy, Fargo Connectors stand repeated use.

Write to Line Material Co., South Milwaukee, Wisconsin, for full details.

Made by
Fargo Manufacturing Co.

DISTRIBUTED BY

LINE MATERIAL CO.

turbs other persons. Analyze your sales efforts! It is your duty to yourself, to your security holders, to your employees and to your patrons to apply corrective measures. Do not be discouraged if at first you meet with indifference. That also is the exemplification of another law of human action. Industry's great need today is to awaken to the seriousness of unfriendly mass opinion and reaction. When industry learns that it alone is responsible for an unfriendly mass opinion, then it will have taken the first step toward correcting that unfavorable reaction. You and I can do our part in this awakening process. Industry must learn to personalize and humanize itself in the eyes of the public. *Business Week* magazine, July 11, in the leading editorial said, "It is silly to consider public relations problems until business first establishes sane and humane public policies."

A knowledge of human engineering and the application of its laws will aid in the establishment of sane and humane public policies. Whether or not industry awakens before it is too late depends upon industry's intelligence and courage.

Explosions by Gas From Cables Are Improbable

[*Continued from page 37*]

quite comparable to those existing in cable ducts and manholes during the accumulation of gases and subsequent explosions. The heat generated in a cable, due to prolonged overload or short circuit, may distill insulating materials; the cable duct and manhole provide the container for collecting the gases and mixing them with air at atmospheric pressure, and the electric arc formed at the point of failure of the cable may furnish the spark for the ignition of the explosive mixture of gas and air.

The severity of a gas explosion is dependent upon the pressure and the proportion of gas and air in the mixture. It is assumed that the gas accumulations in manholes are at atmospheric pressure at the time of explosion, and the effect of such explosions occurring at higher than atmospheric pressure need not be determined. The variables which require determination are the lower and upper limits of gas concentration, within which range the gas forms an explosive mixture with the air at atmospheric pressure.

After the distillation of a known quantity of insulating material has been completed the first step is to determine the volume of gas evolved by direct reading on the graduated gas collector. The second step is to determine the upper limit of the explosibility range by admitting small quantities of air into an explosion chamber filled with a known volume of the gas, agitating the mixture and applying an electric spark after each addition of air, until the gas and air mixture explodes. The lower limit of explosibility is determined by adding small quantities of the gas to the explosion chamber filled with a known volume of air, agitating the mixture and applying an electric spark after each addition of the gas, until the mixture explodes. In each determination for the explosibility limits the quantities of gas and air admitted into the explosion chamber are measured. Knowing the volume of gas or air originally in the explosion chamber and the volume of air or gas admitted into the chamber required to form an explosive mixture, the results may be expressed in percentage of gas of the total volume of the gas and air mixture in the explosion chamber at the time of the explosions.

The test apparatus as it appears in the diagram on page 37 will give reproducible results and will enable the investigator to determine the explosive characteristics of a given insulating material. With the information obtainable from this test the engineer has an important tool with which to estimate the effect of cable faults.

As is to be expected, the gases evolved from different insulating materials possess widely different explosive characteristics. In the case of rubber insulations it has been found that the composition of the rubber compound has a marked effect on the explosive characteristics of the gases evolved. The use of this test has permitted the development of rubber compounds which evolve relatively small volumes of gas, combined with comparatively narrow explosive ranges, the lower limits of which require relatively higher percentages of gas to form an explosive mixture. These characteristics are very desirable in cables for underground installations.

Choosing Transformer Sizes for Distribution Circuits

[*Continued from page* 45]

which the tables are based, namely, the number of customers and the types of load assigned to each in a given individual transformer area, are obtained by an office clerk, described step by step as follows:

1. Copy from the monthly meter reading books each customer's address, route, account and tariff schedule number and the current month kilowatt-hour consumption on which the customer is billed. (The highest monthly consumption in the last twelve months should also be copied if appreciably different from the current month value.) By referring to the circuit maps, each customer can be assigned to the transformer from which he is served, using in networked areas the transformer nearest the customer. The data thus obtained are tabulated on form No. 1.

2. Recapitulate the data on form No. 2, using one horizontal line per transformer, using the following rules in classifying the type of customer.

(a) In case the meter book does not identify a range customer, a consumption of over 100 kw.-hr. per month should be taken as indicating an equivalent range customer.

(b) Each 100 monthly kw.-hr. of commercial lighting or commercial single-phase power should be considered as equivalent to one lighting customer.

(c) Each 500 watts of flat rate water heaters should be considered as equivalent to one lighting customer.

(d) One off-peak water heater is considered as being of the size required for a 30-, 40- or 50-gal. tank. An off-peak water heater used on 60-, 80- or 100-gal. tanks should be considered as equivalent to two heaters.

3. By referring to the previously described Tables III and IV, all the columns on form No. 2 can be correctly filled in, giving the complete solution.

This scheme has proved very valuable in locating under-loaded transformers and in determining whether or not additional transformer capacity is needed when a new customer is added to the secondary system. The cost of placing this scheme in operation is relatively small and the results are apt to be amazing. Experience to date shows a greater accuracy than was originally anticipated. The data should be brought up to date annually.

•

New Buses Put Into Service

Five of ten new buses ordered by the Virginia Electric & Power Company have been added to the present fleet to help move the steadily increasing traffic. They are similar to the medium-sized buses now in use. Officials of the power company said the remaining five vehicles are expected soon from Kent, Ohio, where they were built.

INSULATING

TUBING

DILECTO phenol fibre
DIAMOND VULCANIZED FIBRE
CELLULAC, VULCOID
MICABOND a bonded Mica

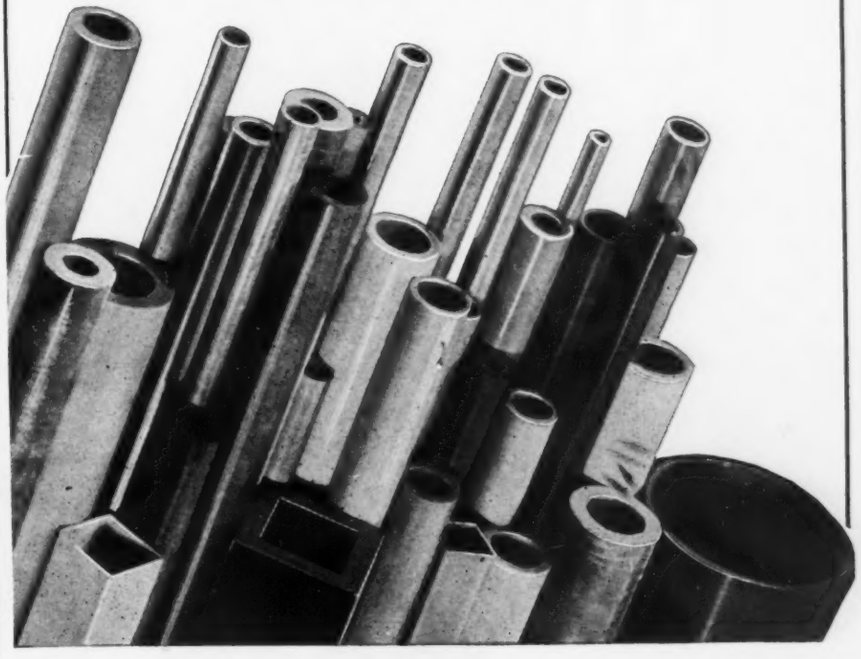
Insulating Tubing has been a special study of the Continental Diamond Fibre Company. If you have an insulating problem involving the use of tubing we can help you regardless of the type you are now using.

Our equipment for manufacturing tubing of various sizes is most complete. We also have unexcelled facilities for fabricating tubing to your specifications.

Since we manufacture practically every type of laminated insulating tubing — including Mica — our recommendations will be unbiased and you will benefit from our knowledge of thousands of applications of insulating tubing in all industries.

We shall be glad to have an opportunity to study your particular problem involving the use of Insulating Tubing and submit marked samples and quotations whether your requirements be standard lengths, cut pieces or fabricated forms.

CONTINENTAL-DIAMOND
FIBRE COMPANY
NEWARK, DELAWARE



New EQUIPMENT AVAILABLE

Polyphase Meters

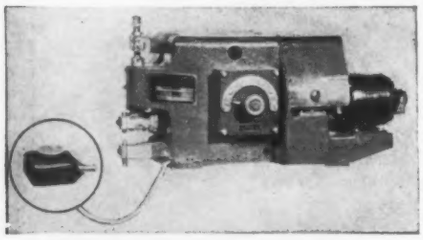
A new line of polyphase detachable meters with two complete elements and disks are said to be suitable for any a.c. application where a two-element watt-hour meter is required and to incorporate all of the advantages of the single-phase detachable meter. One advantage claimed for the meters over the conventional bottom-connected polyphase meters is that they have greater clearances between terminals and consequently greater protection against flashover failures in the terminal assemblies. This is said to be an advantage where meter is connected without potential transformers on 460- and 575-volt services.

Type CS-2 (one of line); four current and two potential terminals; for use on services requiring two-element meter with transformers. **Westinghouse Electric & Manufacturing Co.**, East Pittsburgh, Pa.

•

Spot Welder

Many of the precision features of a standard floor type welder are said to be incorporated in this bench type spot welder, designed for mass production welding of small parts. Compact in size, it is said also to be accurate in timing and precise in the application of pressure. Machine is powered with a 10-kva. transformer and driven by a 1/6-hp. motor working through a reduction unit. Cam at the back actuates a rubber arm to move the spindle up and down in a straight line motion. Machine is also equipped with an adjustable pressure spring and its operation is controlled by a foot switch acting through a solenoid clutch.



Model A; capacity, two pieces of 1/16-in. clean iron or steel; pressure range, 25 to 100 lb.; throat depth, 4¾ in. **Thomson-Gibb Electric Welding Co.**, Lynn, Mass.

•

Circuit Breakers

New line of circuit breakers, designed as service-entrance equipment, incorporate this company's recently announced "Multi-Breaker" units. They are said to provide instant protection to the circuit on short circuit, time lag protection on overloads, and to be non-tamperable. Briefest service interruption is claimed for the devices.

Service-entrance circuit breakers. **Trumbull Electric Mfg. Co.**, Plainville, Conn.

•

V-Belt Drives

V-belt drives on pivoted motor bases. **Rockwood Manufacturing Co.**, Indianapolis, Ind.

Of interest to manufacturing plants should be the announcement of V-belt drives on pivoted motor bases—either floor, vertical or ceiling mounted. Belt stretch is said to be taken up automatically and belt slip to be eliminated with this combination. Furthermore, with these drives tension is removed from the belt when drive is not running. Bases can be purchased separately for use with existing V-belt drives.

Auxiliary Relay

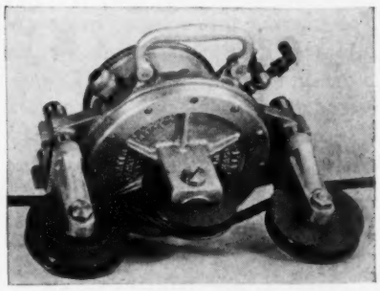
New auxiliary relays can both open and close a circuit and operate on either d.c. or a.c. circuits. They are made in double-pole arrangements, with two or four silver-tipped contacts. It is claimed that the contacts will make and carry 30 amp. for one minute or 12 amp. continuously. All the parts in the magnetic circuit are silicon steel.

Type HGA, without cover; can be furnished with operating coil for 1 to 5 amp. d.c.; sizes available for 6 to 250 volts d.c., 115 to 575 volts a.c. **General Electric Co.**, Schenectady, N. Y.

•

Tension Indicator

This traveling line tension indicator has been designed for the purpose of obtaining tensions or pounds load on small-sized moving cables or wires. Two of the roller-bearing, hardened-steel wheels are attached to the frame; the third wheel is suspended on a sylphon bellows and creates sufficient deflection in the line to indicate variations in tensions or loads. Bellows is connected to sensitive gage making up a closed vacuum loaded system.



Traveling line tension indicator; can be used on running lines up to ⅝ in.; capacity, 15,000 lb. **Martin-Decker Corp.**, Long Beach, Calif.

WHO?

Mr. Central Station Executive

WHAT?

Increased Revenue From Low Income, Low Bill Customers

WHY?

Because the 15 to 30 KWH Monthly Bill Customer Represents the Most Important Part in Today's Central Station Sales Program

HOW?

A Tried and Proven Central Station Sales Plan Designed to Place DeLuxe Quality Electric Refrigerators in the Homes of These Customers at Prices They Can Afford

WHEN?—NOW!

WHERE?

UNIVERSAL COOLER

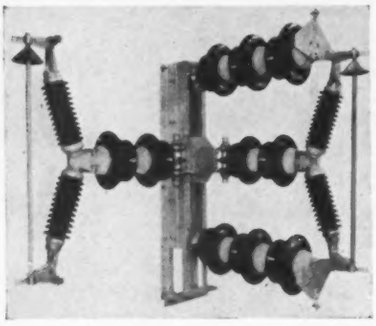
Proven Sales Program Direct Factory-To-Central Station

DETROIT, MICHIGAN

and in Canada Brantford, Ont.

Fuse Arrangement

This vertically mounted, remote-control fuse mounting has two stationary insulator stacks and two sets of independently controlled, centrally located insulator assemblies, supporting expulsion-type fuses and arranged for swinging in a horizontal plane. Normally, one fuse is connected as shown. When blown, it is disconnected and the other fuse inserted in the circuit. This is accomplished by a standard switch mechanism, either manually or automatically by means of a motor- or spring-operated mechanism, together with proper relaying.

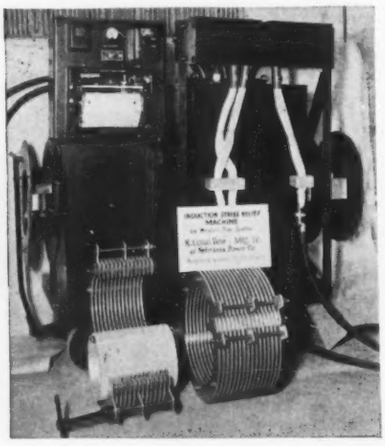


Remote-control 115-kv. fuse mounting. **Delta-Star Electric Co.,** Chicago, Ill.

•

Induction Stress Reliever

Internal stresses in pipe welds, caused by uncontrolled, natural cooling after the welding operation, can be relieved by heating the weld to a proper temperature, letting it soak and then reducing the heat at a controlled rate. This is done by the electric stress reliever illustrated. Device consists of a heavy-current helix for inductively heating the weld, together with step-down transformer and necessary control apparatus. Heating coils are available in four sizes, to treat pipe from 4 to 24 in. in diameter. Two sizes of transformer are offered, 97 or 150 kva.

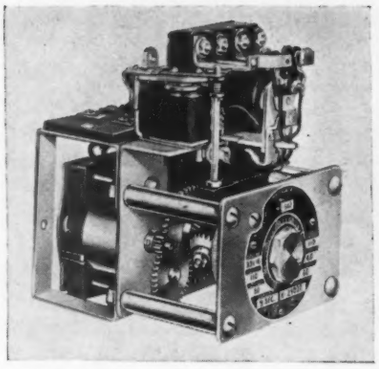


Electric induction stress reliever for heat treating pipe welds; available on rental basis. **Detroit Electric Furnace Co.,** Detroit, Mich.

•

Time-Delay Relays

Time ranges of new motor-driven time-delay relays start with a maximum of 35 seconds and include 1¾, 5¼, 12¼, 26¼, 42 and 63 minutes. Differential gearing is used instead of clutches and a magnetically operated brake has been designed for the gear train. Standard midget relay, built into the device, provides various load contact combinations, including double pole, double throw. Relay is said to be immediately recycling; quick make and break contacts are furnished with all contact combinations.



Motor-driven time-delay relay, for 60-cycle, 110- and 220-volt operation. **Ward Leonard Electric Co.,** Mount Vernon, N. Y.

•

Test Meters

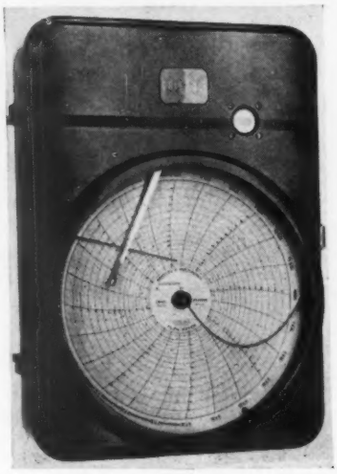
Type J; 1, 5, 10, 25, 50 amp., 115/230 volts, or 1, 5, 25 amp., 115/230 volts. **Sangamo Electric Co.,** Springfield, Ill.

Portable test meters, furnished in two types, with five and three current ranges, have been announced recently. They are said to have straight-line accuracy and ample current-carrying capacity up to 200 per cent rated load. Assembly is completely sealed in a neat-appearing, easily carried aluminum case, with all knobs and current terminals accessible above the case. Silver contact buttons are said to assure positive contact.

•

Electric Flow Meters

Electric flow meters for steam, liquids and gases are now available; they employ a standard meter body to measure the differential across an orifice. Readings are transmitted over a two-wire circuit—telephone circuit included—which does not enter into the calibration of the instrument, it is claimed. All electrical contacts are inclosed in glass; conduit openings are provided so that the instrument may be used with modern wiring systems.



Electric flow meters. **The Bristol Co.,** Waterbury, Conn.

Voltage Regulators

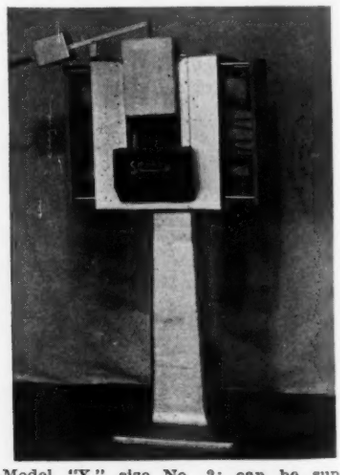
Suggested applications for this new voltage regulator include its use with electrical equipment to control voltage, illumination, motor speed or heat. It is claimed that the device permits smooth, continuous control of voltage from practically zero to normal line voltage with maximum amperes at any setting, that it is also capable of stepping up the output to values considerably higher than line voltage and that it has no effect on power factor and does not cause waveform distortion or line surges. Voltage is varied by rotating the carbon brush which makes contact between the load and the transformer winding surrounding an annular steel core.

Type TH Transtat, cover removed; standard sizes for loads up to 2.5 kva. on 115- or 230-volt, a.c. lines. **American Transformer Co.,** Newark, N. J.

•

Electric Furnace

Tools of the maximum hardness and cutting performance may be produced using this high-speed, steel-hardening furnace, it is claimed. Four heating elements are used, two above and two below the muffle. Air-cooled terminals are employed. Terminals and all electrical contacts are shielded; heating elements will give 1,000 hours of service, it is said. Manufacturer states the furnace will heat from cold to 2,350 deg. F. in seventy minutes, and that the energy consumption at this temperature is between 4½ and 9 kw., depending on the amount of work hardened.



Model "Y," size No. 2; can be supplied with any make of temperature control or connected to suitable control equipment; with pedestal or for bench mounting. **The Sentry Co.,** Foxboro, Mass.

21,887,774

DISSATISFIED Customers

AMERICA as a nation was founded on dissatisfaction! . . . The refusal of a people to be content with their lot. . . . And every development, every forward-step since the landing of the dissatisfied Pilgrims, has been due to this same refusal to be satisfied.

The electrical industry has *thrived* on dissatisfaction.

First, people demanded electricity for lighting because they were dissatisfied with kerosene and gas. And as electricity has been applied to all the household tasks and needs, to washing, ironing, cooking, refrigeration, heating, dissatisfaction has fostered markets. Scrub boards and tubs have been supplanted with electric washers; sad irons with electric irons and ironers; ice-boxes with electric refrigeration; brooms and carpet sweepers with vacuum cleaners; coal, gas and other types of fuel stoves with the electric range.

Progress in home electrification, therefore, keeps step with dissatisfaction with old ways, old customs, and the desire for something better.

The greater the measure of dissatisfaction with the old lot, the more rapid the turning to the new.

That is why, today, the electrical industry has a problem in making its 21,887,774 domestic customers dissatisfied with their homes they now live in. *And why Electrical Merchandising offers a program to get complete home electrification under way.*

Why Bring that Up? —BECAUSE .

Now is the time to do this because a rapidly expanding housing market creates opportunity for the building of new, properly electrified homes and the electrical modernization of existing homes.

An opportunity such as has not faced the electrical industry since the 1920's. (And we missed that one.)

An opportunity that the electrical industry — manufacturers of appliances, wiring materials, lighting equipment and heating and air conditioning — distributors, dealers, contractors and utilities cannot afford to miss again.

Manufacturers and distributors of the materials and devices that, more than anything else, have helped to raise the American standard of living, have suffered for years from the inadequate wiring and equipment that were the rule in the home building and home modernizing of the past.✳

And they will continue to be hampered in the wider use and sale of electrical appliances, and continue to suffer in loss of revenue through only *partial* and inadequate use of equipment unless dissatisfaction with present homes, and their limited, inadequate electrical facilities is created in the public mind.

LET'S take a look at the opportunity offered by the 1937 new home market. Best estimate is that some 425,000 new homes will be built in 1937. Of this number 70 per cent, will be built to sell for $4,500 to $7,500; 60 per cent, approximately 255,000 at an average of $6,000.

$6,000 homes, if similar to those built in the recent past, will provide but a meager market for wiring, lighting and installed appliances; and they will produce for utilities little if any better than 720 kw.-hrs. per year, the present average.

Think, however, what it will mean if these homes when built are adequately wired, adequately lighted, provided with electric kitchens and even partial air conditioning equipment! And this end can be accomplished if the industry sets before home buyers a fact that they do not now realize: *that this full electrification can be had for an astonishingly small additional investment.* Show builder and buyer that on a $6,000 house the cost of full electrification is only an additional $600 and they will not be satisfied with the current standards of electrical wiring, lighting and equipment.

For it is a fact that by taking the amount allocated for inadequate wiring and lighting, for an ordinary heating system, for a less than modern kitchen, and adding the amounts necessary for an electrical kitchen, adequate wiring, good lighting, automatic heat and humidification, the purchaser will increase the cost of his home by only about 10 per cent.

The home buyer benefits not only in vastly more comfortable living, but in a greatly enhanced resale value for his home; the more complete the electrification the greater the insurance against owning an obsolete, unmarketable property.

The value to the electrical industry of such a public awakening is a vast increase in sales of appliances and wiring and a kw.-hr. use multiplied many times the present average. One home fully electrified is worth eight average customers.

BUT the complete electrification of *new homes* is only a share of the opportunity for the electrical family.

There is also the even greater opportunity to be found in electrical modernization of *existing* homes.

Modernization, however, is to bring *old* homes up to the standard set by *new* homes. By raising the standard of electrification in new homes modernization is stimulated.

✳ This inadequacy handicap is illustrated by going back to the year 1924 when the record number (1,748,390) of new domestic customers were added to the lines. In that year an analysis of 8,000 homes showed an average of 3.4 convenience outlets, and a total of 954 watts of lighting per home. The industry at that time recommended a "conservative ideal" of 10 convenience outlets and 1,845 watts of lighting. Today the home is little better in respect to connected lighting and outlets, but the industry now recommends 40 to 50 convenience outlets and 5,000 watts of lighting alone. Also, electric kitchens, home laundries and air conditioning systems.

NOW is the time to create in the public mind the image of the home electricity creates for them: the adequately wired, properly lighted, air conditioned home, freed from drudgery through complete appliance installations, the envy of their neighbors, a delight to live in. Plant this ideal firmly in the minds of home buyers and the electric industry as a whole will feel an immense acceleration in its rate of progress.

The obsolete character of existing homes becomes more apparent by contrast. ✳✳

Two prime forces working together are necessary to accomplish this end. These forces are: (1) Full information on the new high standard of home electrification at a low cost placed in the hands of every industry representative who can reach and influence the public. (2) More Electrical Homes open to the public.

Electrical homes as shining examples of better living have been the most potent sales force in the hands of the industry; and important electrical home projects are now active or under way.

The Niagara-Hudson System is energetically laying the ground work of a great promotion in better homes and is building three model homes which will be opened in May. The Brooklyn Edison Company has equipped a beautiful model home at its headquarters. Many other utility companies and local associations are engaging in this type of promotion. Manufacturers also are playing a large part in this activity. The General Electric Company's New American Homes are this year being visited by hundreds of thousands of prospective home buyers. Kelvinator Corporation has opened for public inspection over 50 homes embodying complete air conditioning and electric kitchens.

The Edison Electrical Institute and NEMA have important programs. The Better Light—Better Sight activity grows ever more effective. The Kitchen Modernization Bureau is getting away to a splendid start and will influence the planning and equipment of an ever greater number of new and old homes. A wiring adequacy campaign will be carried on by NEMA in 1937.

All these are important drives in the right direction. And yet, this enormous program requires above all things a visualization of the complete home which the industry is striving for and the public is beginning to want.

ELECTRICAL MERCHANDISING proposes to play its part in the program by visualizing the electrical home in print.

ELECTRICAL MERCHANDISING HAS A PROGRAM

THIS program involves nourishing the seeds of dissatisfaction with inadequate electrical standards in the home by (1) *picturing the attainable ideal of home electrification*, and (2) *the ease and economy with which this ideal can be reached by acting now rather than later.*

It's a big program to do a big job—an ideal program for an industry that has never failed to reach its objectives when they were clearly defined and when a comprehensive plan for group and individual effort and initiative was set forth. It's a program that calls for a powerful sustained surge, rather than a "splash" campaign—for promotional pressure to be applied without let-up throughout 1937.

This program has for its objectives through home electrification these two major goals:

(1) $100,000,000 *additional appliance, wiring, lighting equipment and air conditioning business for* 1937

(2) 600,000,000 *annual additional kilowatt hours and the revenue that will result therefrom, for the light and power companies of America.*

[SEE NEXT PAGE]

✳✳ The seed of dissatisfaction is planted and ready for intensive cultivation. This is shown by the Niagara-Hudson System's survey on what people want in housing. 11,207 people set down their wants in detail. More than that, they included their pet peeves. Their major dissatisfactions are twenty in number and included five that specifically related to electrical problems. Second peeve on the list (first was not enough closet space) was "not enough electrical outlets." Third and fourth were "can't heat rooms properly," and "poor kitchen arrangements." Others were "poor hot water heater" and "lighting fixtures glary."

HIGH spot in this program will be the May number of ELECTRICAL MERCHANDISING.

This May number will be, in effect, *a printed electrical home*. Its pages will be devoted entirely to the wiring, lighting, equipment (appliances for kitchen, laundry, living, dining, bedroom, nursery) and air conditioning of the home. It is designed as a major contribution to bring home electrification in keeping with today's and tomorrow's homemaking standards — away from those of yesterday.

It will be a major contribution because an electrical home in print extends the electrical home influence into territory where electrical home exhibits are not feasible, and increases the effectiveness of such homes in places where they will be exhibited during 1937.

The Electrical home in printed form is valuable because it is not possible to build and show ideal electrical homes everywhere. Furthermore, the electrical home is too expensive a form of promotion for the small town utility and the dealer. Again, its very popularity defeats a part of its objective. Crowds are often so large that the visitor carries away a confused idea of the various features and has no clear picture in his or her mind of how this equipment could be applied to their own home building or rehabilitation program.

MAY ELECTRICAL MERCHANDISING will, therefore, undertake to provide in most attractive printed form the fascinating story of the ideal home electrical, treating every phase of the application of electricity to better living.

With this number, which will be a complete manual on the subject, every dealer and his salesmen will have at their finger-tips data, arguments and illustrations of electric home features which they can use in selling. Architects, builders and home buyers into whose hands this issue will be placed will have this absorbing story presented as a complete and balanced whole, with all the details necessary for informed specification and purchase.

The text for this issue will be prepared by recognized authorities in their respective fields and by the staff of ELECTRICAL MERCHANDISING in consultation with these authorities. Lavishly and beautifully illustrated, much of it in color, printed on heavy coated paper, it will surround the purchase and use of electrical home equipment with an aura of glamour that we believe has never been given these objects of utility before.

The entire May issue is planned to create the desire for a home which shall be modern in the electrical sense. It will emphasize style as well as utility. It will create dissatisfaction with anything less than full home electrification.

With this complete and comprehensive printed electrical home exhibit in the hands of the trade, electrical distributors, dealers and contractors will have a neutral, unbiased, authoritative "sales manual" of what can be done and what should be done to adequately electrify the 425,000 new homes that will certainly be built in 1937 — and the countless existing dwellings that will be re-conditioned and modernized.

THUS the May ELECTRICAL MERCHANDISING, in the hands of the trade and the public, can be made a most potent factor in achieving the goal of an additional 10 per cent or more on the cost of homes planned devoted to the purchase and installation of adequate wiring, adequate lighting, electrical kitchen and home laundry, and at least a partial air conditioning system with provisions for subsequent additions.

This is the objective and the program for 1937. To this program ELECTRICAL MERCHANDISING will devote itself and its resources. In this program it invites the cooperation and support of the industry — manufacturers, wholesalers, distributors, dealers, contractors, public utilities, together with associations and group interests.

Electrical Merchandising

330 W. 42nd St. New York, N. Y.

Mercury Tungsten Lighting Aids Shipyard Draftsmen

[*Continued from page 39*]

Indirect light sources of various sorts carrying incandescent lamps were also considered, but were found to lack the color quality to mix best with daylight for good seeing conditions.

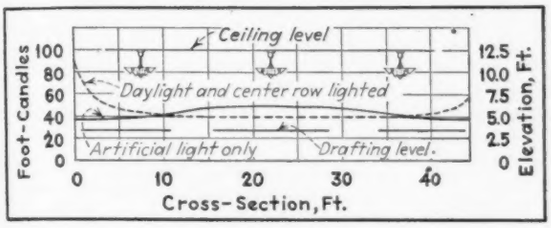
Trial installation made

The application of the new mercury-vapor light sources to industry was of interest to us and so it was decided to make a trial installation of a combination of mercury and "Mazda" units, both of the direct low-pressure and the indirect high-pressure type. These were tried out for a sufficient time to get the reactions of the draftsmen, with the following interesting results:

Indirect Holophane "R-1000-VM" combination of 400-watt high-pressure mercury and four 200-watt "Mazda" lamps provided the highest intensity, without shadows or reflected glare, and a color value that was truly remarkable in its close blend with daylight. A canopy, especially designed, carries the transformers and the complete assembly. This consists of a prismatic glass refractor directing the light from the mercury-vapor lights onto a wide spread on the ceiling surrounded by four "Mazda" lamps attached to an aluminum mask.

Average intensity of 33 to 40 ft.-candles prevails throughout the drafting rooms with a spacing of about 15x15 ft. and a 12-ft. ceiling with a primer white coat finish only.

The results are shown by the charts. Note that on a clear day the average intensity readings taken at a drafting table level, across the room with the side row of lights operating, varies little; also, the color value is within 10 per cent of daylight value. So there is the equivalent of daylight on all boards. Venetian blinds have been provided in the new drafting rooms better to control daylight and the direct rays of the sun, with the result that uniform illumination can be had at all times.



Light distribution curves for artificial light only and for combined center row of units with daylight, in Fore River drafting room

Municipal Plants

DELAND, FLA.—By a vote of 710 to 471 citizens have voted in favor of the establishment of a municipally owned electric generating plant and distribution system. P.W.A. has already approved plans for the construction of a plant, estimated at $468,000. The project calls for a loan of $351,000 and a grant of $117,000.

CARTERSVILLE, GA.—Mayor and City Council have voted a rate reduction to small users of electricity, the new rates to become effective on the January 31 bills. The minimum rate offered by the system was $1 for 15 kw.-hr. Under the new rates the minimum charge will be $1 for 20 kw.-hrs.

ELDORADO, ILL.—Petition signed by more than 350 voters, demanding a referendum election on the 20-year franchise recently granted the Illinois Power & Light Company, has been presented to City Council. The ordinance granting the franchise was passed last month by a 3 to 2 vote of the commissioners.

BATAVIA, ILL.—City Council voted to reduce the December bills of the customers of the municipal light and power plant 25 per cent.

SOMERVILLE, MASS.—By a vote of 6 to 3 the Board of Aldermen voted to kill a municipal ownership plan, thus ending for two years further possibilities of a city power system.

MEDFORD, MASS.—By a unanimous vote the Board of Aldermen recently turned down a municipal ownership plan.

ALLEGAN, MICH.—The ten-year legal battle between the city and the Consumers Power Company over the former's municipal power plant flamed anew when Judge Fred T. Miles issued a court order temporarily enjoining the company from erecting transmission lines in the city without permission from the city council. The city has requested the court to require the company to remove all equipment including wires and poles from the city and that the court issue an order to the effect that the company has no right to operate a transmission system within the city.

ST. CLOUD, MINN.—By a vote of 2,139 to 1,168 citizens have renewed for fifteen years the electric power franchise held by the Northern States Power Company. The new franchise provides reduced rates.

TRENTON, MO.—Missouri Public Service Company has filed a new injunction suit in the United States District Court at Kansas City in an effort to prevent this municipality from proceeding with the construction of its

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own light and power plant and distribution system. In the new action the city of Trenton and Fairbanks, Morse & Company, contractors for equipment, were named as defendants. This legal move is the second in the federal court in Kansas City. In 1935 Judge Merrill E. Otis refused the company an injunction, holding that a P.W.A. grant and loan would be legal within the meaning of the constitution. In this second petition the company calls attention to the fact that the appellate court of this circuit subsequently has held, in a case known as Arkansas-Missouri Power & Light Company versus the City of Kennett, Mo., that a contract similar to that existing between Trenton and the P.W.A. is void. The company further asserts that the city may not legally award contracts for erection of the municipal plant as it has delegated all authority over the plant to the P.W.A. The company also alleges that Fairbanks, Morse & Company, by taking part in political maneuvers in Trenton for the establishment of the plant has obtained from the city administration a contract for equipment providing for an expenditure purportedly higher than had been offered in other bids. The contract is for $119,543.

PENN YAN, N. Y.—Village board marked the December bills of 2,119 customers of its municipal electric plant "paid." The bills totaled $5,000. This "extra dividend" has been maintained since 1930.

SHULLSBURG, WIS.—Wisconsin Public Service Commission has given the city until February 27 to complete acquisition of the local plant of the Interstate Light & Power Company. This constitutes an extension of the four months originally granted. The city was unable to arrange for financing the acquisition in the allotted time.

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Recent Rate Changes

OKLAHOMA GAS & ELECTRIC COMPANY has reduced its electric rates to 127,000 customers. The cut, which is on a sliding scale, will mean a saving of approximately $625,000 in the state, about $260,000 in Oklahoma City. It will not affect 7,000 customers who receive minimum bills.

CONSOLIDATED EDISON SYSTEM electric companies have filed new rates which will save $4,700,000 annually for consumers using energy for commercial, manufacturing, wholesale and charitable purposes, the New York Public Service Commission has announced. The new rates, which become effective on February 1, are part of the general rate reduction program recently announced by the Consolidated, which is expected to save consumers about $7,000,000 annually.

SCRANTON ELECTRIC COMPANY has filed a new rate schedule, effecting a saving of approximately $660,000 annually for its customers. The Pennsylvania Public Service Commission stated the reductions resulted from informal conferences. New rates will go into effect February 15.

NEW YORK PUBLIC SERVICE COMMISSION has announced that the customers of the old Bronx Gas & Electric Company would soon begin receiving refunds, totaling $400,000 for all residential customers, representing the difference in rates paid for the energy and the lower rates ordered by the commission and since sustained in the courts. The checks will represent approximately 10 per cent of the bills rendered between August 1, 1935, and January 1 of this year. A previous refund, for the period prior to August 1, 1935, totaling $440,000 was made by the company last summer.

NEW YORK POWER & LIGHT CORPORATION has filed a revision of its primary voltage industrial rate with the Public Service Commission, which lowers the rate by one mill per unit in the final energy block of the rate. This will save the few large consumers served under the rate about $26,000 a year.

BRITISH COLUMBIA ELECTRIC RAILWAY COMPANY has announced reductions in electric light rates in Victoria, B. C. The reduced charge amounts to one cent a kilowatt-hour and is designed for commercial consumers of the city. The new rate will be 5 cents per kilowatt-hour for the first 500 kw.hr.; 4 cents for the second 500 and 3 cents for the balance, as against the former rate of 6 cents for the first 500; 5 cents for the second; 4 cents for the third and 3 cents for the balance. With reductions recently made to domestic consumers, the saving to consumers will total approximately $100,000 it is stated.

KENTUCKY PUBLIC SERVICE COMMISSION has dismissed the complaint of the city of Russell against the Kentucky-West Virginia Power Company over rates charged for electricity. The complaint was dismissed on motion of the city.

ILLINOIS COMMERCE COMMISSION in a report to Governor Horner states that rate reductions ordered during the first eleven months of 1936 saved public utility patrons $5,384,478. The report which was submitted by Chairman James M. Slattery, claimed the reductions were as follows: electric, $4,346,238; gas, $244,876; telephone, $771,651; water, $11,230; heat, $10,483.

SYRACUSE LIGHTING COMPANY has filed with the New York Public Service Commission a revision of its electric rate schedules which offers a new separate meter commercial cooking rate in portions of the company's territory. The new commercial cooking and water heating rate is available to customers taking service under the specified commercial and industrial rate applying in each district in which the new rate is effective. The new rate has a minimum charge of $2.00 net per month and net energy charges of 4 cents per kilowatt-hour for the first 50 kw.-hr. and 3 cents per kilowatt-hour for excess use. A special provision of the rate states that seasonal service is available upon payment of $24 in advance.

ILLINOIS POWER & LIGHT CORPORATION has announced electric rate cuts to average $2.25 a year for 33,000 customers. The rate reduction is estimated to total $75,000.

SPRINGFIELD GAS & ELECTRIC COMPANY proposed a compromise to the Missouri Public Service Commission in protesting a $215,000-a-year electric rate reduction order as "confiscatory." The commission took the compromise, calling for a $157,000-a-year cut, under consideration after it had been opposed both by Springfield city officials and two citizens' groups.

CAROLINA POWER & LIGHT COMPANY customers in South Carolina will receive reductions on their light bills, effective January 26, totaling $180,000 annually. At the same time the new rates go into effect in South Carolina, North Carolina customers will likewise begin to benefit by a reduction there totaling $550,000 annually. Out of the total of $180,000 to be sliced from the bills of South Carolina customers, residential consumers will benefit by $94,000, commercial $56,000 and large power consumers $30,000.

Sales Opportunities

MIDLAND, MICH.—Dow Chemical Company plans installation of motors and controls, regulators, conveyors and other equipment in plant extensions and improvements to be carried out during 1937, including expansion in chlorine and caustic soda works, ethylene products plant, carbon tetrachloride plant and other divisions. Entire program will cost about $1,000,000.

DENVER, COLO.—Bureau of Reclamation, Denver, receives bids until January 21 for three or four 1,667-kva., 60-cycle, single-phase, oil-insulated, self-cooled, 16,500/34,500-volt auto-transformers of load-ratio control type; for one 34,500-volt, 600-amp., triple-pole, single-throw, outdoor-type, gang-operated air-break switch and one outdoor type metering equipment with accessories for Boulder power plant, Boulder Canyon Project, Arizona-California-Nevada (Specification 867-D); also, until January 27, for electrical control equipment, consisting of one seven-panel main control board and auxiliary apparatus, three master-control cubicles, one 2,300-volt switchboard comprising seven cubicle-type control units for Imperial Dam and desilting works, All-American Canal System, Boulder Canyon Project, Arizona-California-Nevada (Specifications 869-D). Equipment in both cases will be installed by Government.

NEWARK, N. J.—Swift & Company, Union Stock Yards, Chicago, Ill., meat and food products packers, plan installation of motors and controls, conveyors, regulators and other equipment in new edible oil and other food processing plant on 18-acre tract of land at Port Newark, recently secured from city. Initial units will cost close to $750,000 and ultimate project represents investment of approximately $2,500,000.

FAIRFIELD, ME.—Central Maine Power Company, Augusta, Me., plans rebuilding of power substation and switching station at Fairfield, recently destroyed by fire. Loss estimated close to $160,000, including equipment.

WASHINGTON, D. C.—Contracting Officer, Office of Chief of Engineers, Munitions Building, receives bids until January 26 for equipment for power plant (Circular 20).

BRAINERD, MINN.—Crow Wing Co-Operative Power & Light Association, Brainerd, recently organized, J. L. Bowers, secretary, has plans and surveys under way for primary and secondary lines for rural electrification in parts of Crow Wing and Morrison Counties, totaling about 200 miles, with several outdoor substation units, metering and service facilities. Fund of $240,000 is being arranged through federal aid.

BROOKLYN, N. Y.—Signal Corps Procurement District, Army Base, Fifty-eighth Street and First Avenue, receives bids until January 25 for 120,000 feet of cable and 119 reels (Circular 107); also, until January 29, for 127,000 feet of cable and 127 reels (Circular 101).

AVON, CALIF.—Associated Oil Company, 79 New Montgomery Street, San Francisco, Calif., plans installation of motors and controls, transformers and accessories, electric-operated pumping machinery and other equipment for 1937 expansion and improvement program at oil refining plant at Avon. Cost close to $1,500,000.

KANSAS CITY, KAN.—Board of Public Utilities, City Hall, Charles A. Lowder, secretary, receives bids until January 27 for construction of a two, three and six-story addition, 98 x 130 feet, to municipal power plant in Quindaro district. Cost estimated about $350,000. Burns & McDonnell Engineering Company, 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

SALISBURY, MD.—Maryland Light & Power Company, Salisbury, plans new transmission from present system at Piscataway to point near Leonardtown, including several branch lines to neighboring areas. Cost about $150,000. At later date, company plans new transmission line to Point Lookout and vicinity, with power substation and distributing lines in that district.

KNOXVILLE, TENN.—Director of Purchases, Tennessee Valley Authority, receives bids until January 28 for control and distribution switchboards for operating building at Guntersville Lock, as per specifications on file.

CHICAGO, ILL.—Galvin Manufacturing Corporation, 847 West Harrison Street, plans installation of motors and controls, regulators, conveyors and other equipment in new plant on West Augusta Boulevard for automobile radio manufacture, including parts and assembling. Cost close to $250,000. Victor L. Charn, North Tower Court, is architect.

VALPARAISO, IND.—Plans electrification of waterworks pumping station, including motors and auxiliary equipment for six main pumping units, two diesel engine units and other equipment. Cost estimated about $160,000. Charles Brossman, Chamber of Commerce Building, Indianapolis, Ind., is consulting engineer.

POCAHONTAS, IOWA — Pocahontas County Rural Electric Co-Operative, Inc., Pocahontas, recently organized, has plans maturing for primary and secondary lines in parts of county, totaling about 90 miles, with outdoor substation units and service facilities. Fund of $95,000 has been secured through federal aid.

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Lighting Course for Public

Roy A. Palmer, illuminating engineer of the Duke Power Company, announces plans for an educational course in lighting for the general public during January and February.

Mr. Palmer is in charge of the course, which has been approved by the Charlotte public schools and meets requirements of the vocational department of the evening schools. To those attending will be given a certificate by the vocational department if they have attended 75 per cent of the lectures.

•

N.Y. Exchange Lists Stock

The committee on stock list of the New York Stock Exchange has announced that it had approved the application of the Nash-Kelvinator Corporation to list 4,375,600 shares of $5-par capital stock.

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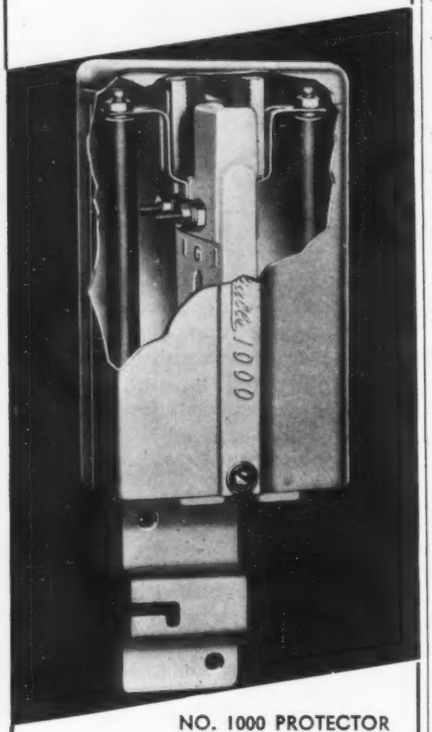

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AIR COMPRESSORS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Smith & Co., Gordon, Bowling Green, Ky.

AIR-CONDITIONING EQUIPMENT
General Electric Co., Schenectady, N. Y.
Kelvinator Corp., Detroit, Mich.
Sturtevant Co., B. F., Boston, Mass.
Westinghouse E. & M. Co., E. Pittsburgh, Pa.
Worthington Pump & Mchy. Corp., Harrison, N. J.

ALTERNATOR, ELECTRONIC
Ward Leonard Elec. Co., Mt. Vernon, N. Y.

AMMETER, CLIP-ON
Columbia Elec. Mfg. Co., Cleveland, Ohio
Ferranti Electric, Inc., New York, N. Y.

ANALYSES, REVENUE
Recording & Statistical Corp., New York.

ANCHORS, GUY
Chance Company, Centralia, Mo.
Everstick Anchor Co., Fairfield, Iowa
Hubbard & Co., Pittsburgh, Pa.
Kearney Corp., James R., St. Louis, Mo.
Line Material Co., South Milwaukee, Wis.

ANNUNCIATORS
Cory Corp., Chas., Brooklyn, N. Y.

APPLIANCES, HEATING
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., New York, N. Y.
McGraw Electric Co., Chicago, Ill.

BATTERIES, STORAGE, ALL APPLICATIONS
Electric Storage Battery Co., Phila., Pa.
Gould Storage Battery Corp., Depew, N. Y.
Philadelphia Storage Battery Co., Phila., Pa.

BLOCKS, LINEMEN'S CABLE STRINGING
Western Block Co., Lockport, N. Y.

BOILERS, STEAM
Babcock & Wilcox Co., New York, N. Y.
Combustion Engineering Co., New York, N. Y.

BRACKETS & WIREHOLDERS, INSULATED
Hubbard & Co., Pittsburgh, Pa.
Line Material Co., South Milwaukee, Wis.
Porcelain Products, Inc., Parkersburg, W. Va.
St. Louis Malleable Casting Co., St. Louis, Mo.
Utilities Service Co., Allentown, Pa.

BRASS AND BRONZE
Bridgeport Brass Co., Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.

BRUSHES, CARBON
National Carbon Co., Cleveland, Ohio
Ohio Carbon Co., Cleveland, Ohio.
Speer Carbon Co., St. Mary's, Pa.

BURNERS, OIL, GAS, PULVERIZED FUEL
Babcock & Wilcox Co., New York, N. Y.
Combustion Engineering Co., New York, N. Y.

BUS BAR SUPPORTS
Burndy Engineering Co., New York, N. Y.
Electrical Engrs. Eqpt. Co., Melrose Park, Ill.
General Electric Co., Schenectady, N. Y.
Schweitzer & Conrad Inc., Chicago, Ill.

BUS BARS & TUBES
American Brass Co., Waterbury, Conn.
Chase Brass & Copper Co., Waterbury, Conn.

CABLE ALUMINUM
Aluminum Co. of America, Pittsburgh, Pa.
General Cable Corp., New York, N. Y.

CABLE, NETWORK
Anaconda Wire & Cable Co., New York, N. Y.
American Steel & Wire Co., Chicago, Ill.
Crescent Ins. Wire & Cable Co., Trenton, N. J.
General Cable Corp., New York, N. Y.
Hazard Ins. Wire Works, Wilkes-Barre, Pa.
Okonite Co., Passaic, N. J.
Rockbestos Products Corp., New Haven, Conn.

CABLE, PAPER INSULATED
American Steel & Wire Co., Chicago, Ill.
Anaconda Wire & Cable Co., New York, N. Y.
General Cable Corp., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Kennecott Wire & Cable Co., Phillipsdale, R.I.
Okonite-Callender Cable Co., Passaic, N. J.
Phelps Dodge Copper Products Corp., N. Y.
Roebling's Sons Co., J. A., Trenton, N. J.
Simplex Wire & Cable Co., Boston, Mass.

CABLE, PARKWAY
American Steel & Wire Co., Chicago, Ill.
Anaconda Wire & Cable Co., New York, N. Y.
Crescent Ins. Wire & Cable Co., Trenton, N.J.
General Cable Corp., New York, N. Y.
Kerite Ins. Wire & Cable Co., New York, N.Y.
Okonite Co., Passaic, N. J.
Roebling's Sons Co., J. A., Trenton, N. J.
Simplex Wire & Cable Co., Boston, Mass.

CABLE SERVICE ENTRANCE
Anaconda Wire & Cable Co., New York, N. Y.
Crescent Ins. Wire & Cable Co., Trenton, N. J.
General Cable Corp., New York, N. Y.
Hazard Ins. Wire Works, Wilkes-Barre, Pa.
Okonite Co., Passaic, N. J.
Phelps Dodge Copper Products Corp., N. Y.
Simplex Wire & Cable Co., Boston, Mass.

CABLE, STEEL STRAND
American Steel & Wire Co., Chicago, Ill.
Indiana Steel & Wire Co., Muncie, Ind.
Roebling's Sons Co., J. A., Trenton, N. J.

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JANUARY 23, 1937

Federal Power Policy in Conflict

President Roosevelt postpones immediate decision by appointing third national power policy committee after plea by T.V.A. chairman for conciliation with private power interests brought forth fight-to-finish declaration from Senator Norris.

WHY HE SLEEPS WELL

WE are indebted for this significant story to Mr. W. J. Cameron on the Ford radio program.

"If you please, sir, I know how to sleep on a windy night." Thus responded the good-natured, gawky applicant to Farmer White's offer of employment. "You what?" "I know how to sleep on a windy night." "Well, that's no great recommendation," said Farmer White; "most men can do that only too well."

There was something likable in the honest eyes of the new hired man—something interesting behind what he had said. One night, several weeks later, Farmer White was to learn. The wind had awakened. It gathered itself in great gusts and sent the clouds scurrying across the sky; and it hammered against buildings and tore at the haystacks and howled down the chimneys. Farmer White sat straight up in bed. He knew that wind. Many a time it had wrenched off a door, scattered his hay, bowled over a coop. "John," he shouted. "John, John, where are you?" But John was fast asleep; he might just as well have been in the next town.

Farmer White rushed out into the night, expecting to see everything tumbled about. But he found the stable doors safely fastened, the windows firmly locked, the horses and cattle all snug in their stalls. He found the stacks well roped, the ropes well pegged—the sty secure, the coops firm. Then it came to him—suddenly—just what John meant. Little wonder John slept well when the wind blew.

Isn't there a moral in this story for us as a manufacturer—for you as a purchasing agent, distribution engineer, or manager? Isn't peace of mind, based on the knowledge that you have the best equipment you can buy—the best that can be built—worth far more than any other consideration? We believe it is. That is why we continue to remind you of the built-in values of General Electric apparatus.

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